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MEDICAL ESSAYS
AND
OBSERVATIONS,

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VOLUME II.

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BR. MUS.

PREFACE.

AS we have met with no objection of great weight to the plan laid down in our firſt volume, we flatter ourſelves that it has been generally approved; and therefore have finiſhed our ſecond volume upon the ſame model.

It ſeems, however, we have expreſſed ourſelves either obſcurely or ambiguouſly in ſome particulars; for ſome Gentlemen have underſtood us differently from what we would have wiſhed.

It has been thought, that we propoſed to confine our collection to Scotland; whereas we intended our preface to the firſt volume as a general invitation to all, of whatever country, who deſired to promote the knowledge of medicine, to favour us with their eſſays or obſervations. Though we ſtill reſolve to publiſh the whole work in Engliſh, we hope this will not diſcourage foreigners to ſend us papers, ſince we ſhall endeavour to do juſtice, in a tranſlation, to any that are wrote in Latin or French.

Others have remarked, that we had not mentioned the effects of chemical drugs, as a part of the ſubjects to be treated. It is true, this was not fully enough expreſſed in our ſcheme; but we were hopeful our articles of ſimple drugs and chemical experiments might have included the uſes of their produce.

We have been told, that our meteorological regiſter has not a ſufficient number of obſervations for each day, whereby to know the greateſt degree of heat or cold. We acknowledge this remark to be juſt; but the circumſtances of the obſervator are ſuch as do not conveniently allow of this; and we are afraid ſome readers think that regiſter ſufficiently long already.

Several have deſired we would make ſome application of this regiſter to the account of epidemic diſeaſes: We have put it in every one's power to make a compariſon: but in our judgment a much greater number of yearly obſervations are required, before any concluſions concerning the riſe or return of epidemic diſeaſes can be made from the ſtate of the air.

In the account of improvements, diſcoveries, books, &c. at the end of this volume, we have in a great meaſure ſupplied the deficiences and omiſſions of our firſt volume; at the publiſhing of which it was ſcarce poſſible that all the medical books publiſhed in the preceeding year could have been brought us.

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MEDICAL ESSAYS AND OBSERVATIONS.

ARTICLE I.

The Meteorological Regiſter.

THE inſtruments with which the Obſervations in the following Regiſter were made, are the ſame, and ſituate in the ſame manner, as is deſcribed in Art. II. of Vol. I. of this collection.

JUNE 1732.

D	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather,	Rain. In D.
1	8 a m	29	6	13	0	1	5	W	2	clear	—
	4 p m	29	6	14	0	1	3	N E	1	clear	
2	8 a m	29	8	13	0	1	4	N W	2	clear	0,043
	5 p m	29	8	14	4	1	1	N W	2	clear	
3	9 a m	30	0	13	3	1	3	W	2	clear	
	5 p m	30	0	14	9	1	0	N W	2	clear	
4	9 a m	30	0	13	5	1	5	N W	2	clear	
	7 p m	29	9	15	7	0	7	S W	2	clear	
5	8 a m	29	9	15	4	1	0	S W	2	clear	
	6 p m	29	9	15	4	1	0	S W	1	cloudy	
6	9 a m	29	9	14	6	1	0	W	2	clear	
	5 p m	29	9	14	6	0	8	W	2	clear	
7	9 a m	29	9	14	7	1	0	W	1	cloudy	
	5 p m	29	8	14	8	0	9	N E	1	clear	
8	9 a m	29	8	13	7	1	5	E	2	clear	
	5 p m	29	7	15	2	1	0	E	2	clear	
9	9 a m	29	7	13	3	1	3	E	2	clear	
	5 p m	29	6	14	1	1	3	E	2	clear	
10	8 a m	29	6	13	2	2	0	N E	1	cloudy	
11	9 a m	29	7	13	0	1	9	N E	2	cloudy	
	4 p m	29	7	13	4	1	2	N E	2	clear	
12	8 a m	29	7	13	4	1	4	W	2	clear	
	4 p m	29	7	14	6	1	3	W	2	rain	
13	8 a m	29	6	13	1	3	1	N E	2	cloudy	
	5 p m	29	6	12	7	1	6	N E	2	clear	0,615
14	9 a m	29	6	12	0	2	0	N	2	cloudy	0,052
	5 p m	29	6	13	6	1	4	N W	2	cloudy	
15	8 a m	29	6	12	9	1	6	W	2	cloudy	
	5 p m	29	6	13	7	1	3	W	2	clear	
16	8 a m	29	6	12	3	2	0	N W	2	rain	0,167
	5 p m	29	6	14	5	1	3	W	2	clear	
											0.877

JUNE 1732

D.	Hour.	Baro.		Ther.		Hyg		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		
											0,877
17	9 a m	29	7	13	4	1	4	W	2	cloudy	
	5 p m	29	7	14	7	1	5	W	2	rain	
18	9 a m	29	8	13	5	1	5	W	2	cloudy	
	5 p m	29	8	14	5	1	2	W	2	clear	
19	8 a m	29	7	13	8	1	7	S W	1	rain	
	5 p m	29	6	13	3	2	0	E	1	rain	
20	8 a m	29	5	13	2	1	7	W	2	clear	0,244
	5 p m	29	4	14	5	1	2	W	2	clear	
21	8 a m	29	4	13	7	1	4	W	2	cloudy	
	5 p m	29	4	13	8	1	5	W	1	lowring	
22	8 a m	29	5	13	4	1	7	N W	1	clear	
	5 p m	29	6	14	4	1	5	N E	1	cloudy	
23	8 a m	29	8	14	1	1	7	N E	1	cloudy	
	5 p m	29	8	14	5	1	4	N E	1	clear	
24	8 a m	30	0	14	2	1	5	E	2	clear	0,075
	5 p m	30	1	14	3	1	5	E	2	clear	
25	9 a m	30	2	14	7	1	7	E	2	lowring	
	6 p m	30	2	14	7	1	6	E	1	clear	
26	8 a m	30	3	13	9	2	4	E	2	fog	
	5 p m	30	3	15	4	1	5	E	2	clear	
27	8 a m	30	3	15	0	1	4	E	2	clear	
	4 p m	30	3	15	9	1	3	E	2	clear	
28	8 a m	30	3	14	3	2	3	E	2	lowring	
	3 p m	30	2	15	5	1	6	E	2	clear	
29	8 a m	30	1	14	6	1	8	W	2	lowring	
	8 p m	30	0	15	0	1	4	W	2	clear	
30	8 a m	30	0	14	7	1	5	W	2	clear	—
	4 p m	30	0	15	6	1	2	W	2	cloudy	
H. at a med.		29	8	14	1	1	4			Total depth	1,196
Gr. height		30	3	15	9	3	1				
L. height		29	4	12	0	0	7				

JULY 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In.	D.	In	D.	I.	D.	Dir.	For.		In. D.
1	8 a m	30	1	14	4	1	7	N W	2	cloudy	0,045
	6 p m	30	1	15	5	1	2	N W	1	clear	
2	9 a m	30	0	15	0	1	3	N W	2	clear	
	4 p m	29	8	15	3	1	2	W	3	lowring	
3	8 a m	29	6	13	4	1	4	W	3	clear	
	4 p m	29	7	13	7	1	0	N	2	clear	
4	9 a m	29	7	12	5	1	1	W	3	clear	
	5 p m	29	7	14	3	0	9	N W	2	clear	
5	8 a m	29	8	13	0	1	1	N W	1	clear	
	6 p m	29	8	15	3	1	1	N W	1	clear	
6	8 a m	29	8	14	4	1	8	W	1	lowring	
	5 p m	29	8	15	5	1	3	W	2	fog	
7	8 a m	29	6	15	2	1	6	S W	3	lowring	
	5 p m	29	6	16	1	1	4	S W	2	lowring	
8	9 a m	29	4	15	4	1	3	S W	3	lowring	
	5 p m	29	5	15	1	1	0	S W	3	clear	
9	9 a m	29	5	14	4	1	4	S W	1	lowring	
	4 p m	29	4	15	1	1	2	S W	1	lowring	
10	7 a m	29	3	13	4	1	6	S W	2	clear	
	6 p m	29	2	12	7	1	8	E	2	gr. rain	
11	8 a m	29	3	12	3	2	5	W	2	lowring	0,685
	5 p m	29	3	13	9	1	3	W	2	clear	
12	8 a m	29	4	13	3	1	7	W	1	clear	0,193
	4 p m	29	4	13	7	1	6	N E	1	clear	
13	8 a m	29	3	11	7	3	2	N E	1	clear	
	5 p m	29	3	12	6	3	6	N E	2	cloudy	
14	8 a m	29	4	12	7	3	1	S E	2	cloudy	0,367
	5 p m	29	5	13	2	2	9	S E	2	cloudy	
15	8 a m	29	7	13	6	2	2	S E	2	rain	
	5 p m	29	8	15	2	2	0	S	2	lowring	
16	9 a m	29	9	14	8	2	0	S	1	lowring	
	6 p m	29	9	15	4	1	7	E	0	clear	
											1,290

JULY 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		
											1,290
17	8 a m	29	9	14	3	1	8	N W	1	clear	
	5 p m	29	9	15	3	1	6	N W	2	clear	
18	9 a m	29	9	13	4	1	6	N W	2	clear	
	5 p m	29	9	14	3	1	6	N E	2	cloudy	
19	8 a m	29	9	13	5	1	9	N E	2	clear	
	5 p m	29	9	14	7	1	5	N E	2	clear	
20	9 a m	29	9	13	8	1	7	W	2	clear	
	7 p m	29	8	14	7	1	6	W	2	cloudy	
21	9 a m	29	6	14	3	2	1	S W	2	rain	0,632
	5 p m	29	5	15	4	1	8	W	2	cloudy	
22	8 a m	29	6	12	6	3	0	W	2	lowring	0,140
	5 p m	29	6	13	7	2	5	E	2	lowring	
23	9 a m	29	2	12	4	3	3	N	3	gr. rain	
	5 p m	29	5	12	5	4	3	N W	2	clear	
24	8 a m	29	6	12	3	2	2	N by W	2	clear	0,273
	5 p m	29	7	13	6	1	7	W by N	2	clear	
25	8 a m	29	8	13	0	1	9	W by N	2	clear	
	5 p m	29	8	14	2	1	5	N E	1	clear	
26	9 a m	29	8	13	3	1	6	N W	2	clear	0,642
	4 p m	29	8	13	4	1	6	N	1	cloudy	
27	9 a m	29	7	13	0	1	8	N	1	clear	
	5 p m	29	7	14	9	1	5	S W	1	cloudy	
28	9 a m	29	7	13	9	1	5	W	2	clear	0,157
	4 p m	29	7	14	3	1	3	W	2	clear	
29	9 a m	29	8	13	9	1	6	W by N	2	clear	0,026
	5 p m	29	8	14	4	1	2	W	1	cloudy	
30	9 a m	29	7	14	3	2	5	W by N	2	cloudy	
	4 p m	29	7	14	3	2	5	W by N	2	cloudy	
31	10 a m	29	6	13	6	1	4	W by N	2	clear	0,039
	5 p m	29	7	14	2	1	1	N W	1	clear	
H at a med.		29	7	13	9	1	7			Total depth	3,199
Gr. height		30	1	16	1	3	6				
L. height		29	2	11	7	0	9				

AUGUST 1732.

D.	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain. In D.
1	9 a m	29	8	13	0	1	2	N W	0	clear	—
	5 p m	29	8	13	9	1	1	N E	1	clear	
2	8 a m	29	9	13	1	1	6	S W	1	clear	—
	5 p m	29	9	14	1	1	2	N	1	clear	
3	8 a m	30	0	13	5	1	5	N W	1	clear	—
	5 p m	30	0	14	8	1	3	N	1	clear	
4	9 a m	30	0	13	7	1	6	S	1	clear	—
	5 p m	30	0	14	9	1	1	S E	1	clear	
5	8 a m	30	0	13	9	1	5	S E	1	clear	
	6 p m	29	9	15	6	1	1	S E	0	cl. high	
6	10 a m	30	0	13	7	2	5	E	1	cloudy	
	6 p m	30	0	14	4	1	8	E	1	clear	
7	8 a m	29	9	13	8	2	3	S E	0	fog	
	5 p m	29	9	15	0	1	7	S E	1	clear	
8	8 a m	29	8	13	0	2	5	W	1	lowring	
	5 p m	29	6	14	6	1	4	W	2	clear	
9	9 a m	29	5	13	2	2	0	W	2	cloudy	
	5 p m	29	5	13	6	1	9	E	0	cloudy	
10	8 a m	29	5	12	2	1	7	N W	2	cloudy	
	5 p m	29	5	13	3	1	1	N W	2	cloudy	
11	9 a m	29	6	11	9	1	4	N W	2	cloudy	
	7 p m	29	7	11	5	1	4	E	2	cloudy	
12	9 a m	29	5	12	0	1	4	S W	0	cloudy	0,365
	5 p m	29	4	12	9	1	5	W	1	lowring	
13	9 a m	29	3	12	5	2	0	N E	1	lowring	
	6 p m	29	3	12	0	3	1	N E	2	gr. rain	
14	8 a m	29	5	11	7	3	4	N E	1	cloudy	
	5 p m	29	5	12	7	2	0	N W	1	clear	
15	8 a m	29	6	12	0	2	1	W by S	2	clear	
	5 p m	29	5	13	2	1	5	W	2	clear	
16	7 a m	29	6	12	1	1	7	W by S	1	clear	
	5 p m	29	6	13	4	1	3	W	2	clear	
											0,365

AUGUST 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		
											0,365
17	8 a m	29	7	12	3	1	7	N W	1	clear	
	5 p m	29	7	14	0	1	2	W	1	cloudy	
18	8 a m	29	7	13	5	1	6	S W	2	clear	
	5 p m	29	6	14	9	1	6	S	2	cloudy	
19	8 a m	29	5	14	0	1	9	N W	2	cloudy	
	6 p m	29	5	14	3	1	5	W by N	2	clear	
20	8 a m	29	6	13	6	2	0	S W	1	rain	0,432
	6 p m	29	5	14	0	2	0	S	2	cloudy	
21	9 a m	29	4	14	5	1	8	S W	2	cloudy	
	5 p m	29	5	15	0	1	6	S W	2	clear	
22	9 a m	29	7	12	2	1	8	N E	2	cloudy	
	6 p m	29	7	12	7	1	5	E by N	2	clear	
23	8 a m	29	6	12	4	1	8	E	1	rain	
	5 p m	29	5	13	5	1	7	S W	0	rain	
24	8 a m	29	8	12	5	2	1	W	2	clear	
	4 p m	29	9	13	7	1	3	W	2	clear	
25	8 a m	29	9	13	5	1	5	S W	1	clear	
	5 p m	29	8	14	2	1	5	S W	2	rain	
26	8 a m	29	7	14	6	1	7	S W	2	cloudy	
	5 p m	29	7	13	6	2	0	W	2	rain	
27	9 a m	29	9	12	6	1	8	W by N	2	clear	
	6 p m	30	0	13	7	1	2	W by N	3	clear	
28	8 a m	31	0	12	4	1	5	N W	0	cloudy	
	5 p m	31	0	13	0	1	3	N E	2	clear	
29	7 a m	31	0	11	6	1	5	N E	1	clear	
	5 p m	30	1	12	4	1	4	E	1	clear	
30	9 a m	30	0	12	6	1	8	S W	1	clear	
	5 p m	30	0	14	2	1	5	W	1	clear	
31	9 a m	30	0	12	7	1	5	W	2	clear	0,828
H. at a med.		29	9	13	3	1	6			Total depth	1,625
Gr. height		31	1	15	6	3	4				
L. height		29	3	11	5	1	1				

SEPTEMBER 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		In D.
1	8 a m	30	2	12	3	1	6	N W	1	clear	
	4 p m	30	2	14	0	1	3	N W	1	clear	
2	8 a m	30	2	12	4	2	0	N E	1	clear	
	4 p m	30	3	14	2	1	4	N E	1	clear	
3	9 a m	30	3	12	5	2	5	E	1	miſt	
	6 p m	30	3	12	7	2	5	E	1	miſt	
4	8 a m	30	2	11	7	2	7	N	0	miſt	
	5 p m	30	1	13	6	1	8	N	1	miſt	
5	8 a m	30	1	12	2	2	9	N E	0	miſt	
	5 p m	30	0	13	3	2	6	N E	1	miſt	
6	8 a m	29	8	12	6	2	0	S W	2	clear	
	5 p m	29	7	14	2	1	4	W	2	cloudy	
7	8 a m	29	8	12	8	1	9	E	0	cloudy	
	4 p m	29	9	13	6	1	6	E	0	cloudy	
8	8 a m	29	7	13	3	1	9	S E	1	cloudy	
	4 p m	29	6	14	6	1	5	S W	0	clear	
9	9 a m	29	5	13	9	1	7	S W	0	cloudy	
	5 p m	29	5	12	7	1	8	S W	1	cloudy	
10	9 a m	29	5	12	7	1	7	S W	1	cloudy	
	5 p m	29	2	13	6	1	6	S W	3	lowring	
11	9 a m	29	2	13	0	1	6	S W	3	clear	
	5 p m	28	6	12	5	1	6	S W	4	tempeſt	
12	9 a m	28	8	12	1	1	6	W	3	cloudy	
	4 p m	29	0	12	1	1	4	N W	2	clear	
13	8 a m	28	8	10	5	1	8	W	2	clear	
	5 p m	28	9	11	7	1	6	W	2	cloudy	
14	8 a m	29	1	10	8	1	5	N by W	2	clear	
	4 p m	29	2	12	1	1	1	N W	3	cloudy	
15	8 a m	28	9	11	8	1	3	S W	2	rain	
	5 p m	28	8	11	5	1	5	S W	2	rain	
16	8 a m	29	5	10	3	1	5	N	1	fair	
	5 p m	29	6	11	6	1	1	W	2	fair	

The Regiſter of Rain was not kept this Month.

SEPTEMBER 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind:		Weather.	Rain.
		In	D.	In.	D.	I.	D.	Dir	For.		
17	9 a m	29	0	11	8	1	7	N W	2	fair	
	5 p m	29	0	10	7	1	5	W	3	fair	
18	8 a m	28	9	11	5	1	8	W	3	fair	
	7 p m	29	1	11	4	1	8	W	2	fair	
19	8 a m	29	3	10	8	2	0	W	1	fair	
	7 p m	29	4	10	8	1	7	W	1	fair	
20	8 a m	29	7	10	3	1	8	W	1	fair	
21	8 a m	29	5	12	8	1	6	W	4	ſtorm	
	4 p m	29	6	13	0	1	3	W	4	ſtorm	
22	8 a m	29	8	11	8	1	5	S W	2	cloudy	
	4 p m	29	7	12	6	1	6	S W	2	cloudy	
23	8 a m	29	7	11	5	2	0	W	1	cloudy	
24	9 a m	29	6	13	2	2	1	S W	0	cloudy	
	5 p m	29	7	13	7	2	1	S W	0	rain	
25	8 a m	29	8	12	3	2	1	W	2	fair	
	5 p m	30	0	13	1	1	5	W	0	fair	
26	8 a m	30	2	11	8	2	0	S E	0	fair	
	5 p m	30	3	11	9	1	7	E	1	fair	
27	8 a m	30	2	11	8	1	7	E	1	cloudy	
	5 p m	30	0	12	4	1	5	S E	2	cloudy	
28	8 a m	29	9	11	4	1	5	S E	1	cloudy	
	5 p m	29	9	12	1	1	5	S E	1	cloudy	
29	8 a m	30	1	10	5	1	7	S E	0	fair	
	5 p m	30	1	11	9	1	5	S E	1	fair	
30	8 a m	30	2	9	8	1	6	S E	0	fair	
	5 p m	30	2	11	2	1	4	S E	1	fair	
H.at a med.		29	6	12	2	1	7			Total depth	—
Gr. height		30	3	14	6	2	9				
L.-height		28	3	9	8	1	1				

OCTOBER 1732.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In. D.
1	9 a m	30	1	10	8	1	4	S E	1	fair	
	5 p m	30	0	11	1	1	3	S E	1	fog	
2	8 a m	29	9	10	4	1	5	S E	1	cloudy	0,062
	5 p m	29	7	11	3	1	6	E	1	cloudy	
3	8 a m	29	4	10	8	1	5	E	1	cloudy	
	5 p m	29	2	10	7	2	6	N E	2	rain	
4	9 a m	29	1	10	4	3	0	N E	1	fair	
	5 p m	29	2	10	9	2	4	W	1	cloudy	
5	9 a m	29	2	9	9	2	4	S W	1	fair	
	4 p m	29	1	11	2	2	1	E	1	rain	
6	8 a m	29	3	9	8	2	3	N W	1	clear	0,213
	5 p m	29	3	11	0	1	5	W by N	1	clear	
7	9 a m	29	3	10	4	2	0	S E	1	rain	
	5 p m	29	1	11	4	2	2	S E	1	rain	
8	9 a m	29	1	11	1	2	5	S W	1	fair	
	5 p m	29	2	11	9	2	0	S W	1	cloudy	
9	8 a m	29	0	12	1	2	3	S	1	fair	
	5 p m	29	0	12	7	1	8	S by W	1	fair	
10	8 a m	29	0	11	7	2	0	S W	2	fair	
	4 p m	29	1	11	6	1	8	W	3	fair	
11	9 a m	29	2	10	5	1	9	S E	2	fog	
	4 p m	29	0	11	9	2	2	S W	1	cloudy	
12	9 a m	29	1	11	4	2	2	S W	0	fog	
	5 p m	29	0	11	9	2	5	S by E	1	rain	
13	8 a m	29	1	10	4	2	5	S W	0	cloudy	0,685
	4 p m	29	0	11	1	2	7	W	1	rain	
14	8 a m	29	4	10	4	2	2	S W	1	fair	
	5 p m	29	4	10	5	2	2	S by W	1	fair	
15	9 a m	29	2	11	4	2	7	S by W	1	cloudy	
	4 p m	29	0	12	2	1	0	S by W	0	cloudy	
16	8 a m	29	4	10	[illegible]	2	5	S W	0	fair	0,426
	5 p m	29	2	11	3	2	2	S W	1	rain	
											1,386

OCTOBER 1732.

D.	Hour.	Baro. In.	D.	Ther. In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain.
											1,386
17	8 a m	29	0	11	6	2	3	S W	2	cloudy	
	5 p m	28	9	11	8	2	0	S W	2	cloudy	
18	8 a m	29	0	10	9	2	1	S W	2	fair	
	5 p m	29	1	10	6	2	1	S W	2	cloudy	
19	8 a m	29	4	10	8	2	1	S W	0	fog	0,395
	5 p m	29	5	11	4	2	3	E	1	cloudy	
20	9 a m	29	5	10	8	3	0	N W	0	cloudy	
	5 p m	29	5	10	7	3	0	NE	0	cloudy	
21	8 a m	29	4	10	7	2	9	S E	1	cloudy	
	5 p m	29	4	11	1	2	5	S E	1	fair	
22	9 a m	29	5	11	3	2	3	S W	1	cloudy	
	5 p m	29	5	11	6	2	2	S W	1	cloudy	
23	8 a m	29	7	10	6	2	5	S E	1	fair	
	4 p m	29	7	11	4	3	0	E	2	cloudy	
24	9 a m	29	6	11	2	3	7	N E	2	rain	
	5 p m	29	6	11	5	3	9	N E	2	rain	
25	9 a m	29	5	11	9	3	9	S E	1	fog	
	5 p m	29	6	11	8	3	9	S E	1	fog	
26	9 a m	29	5	12	3	2	6	S E	1	fair	0,530
	5 p m	29	5	12	3	2	9	S E	1	fair	
27	9 a m	29	7	11	5	3	6	S E	1	fog	
	4 p m	29	6	11	6	3	4	S E	1	fog	
28	9 a m	29	4	11	3	2	6	W	2	cloudy	
	4 p m	29	4	10	6	2	1	W	1	fair	
29	8 a m	29	6	9	5	2	4	W	1	fair	
	4 p m	29	7	10	4	2	2	N W	2	fair	
30	9 a m	29	8	10	2	2	5	W	1	cloudy	0,112
	5 p m	29	9	10	5	2	5	W	1	cloudy	
31	8 a m	29	9	10	5	2	4	W	0	cloudy	
	5 p m	29	9	10	7	2	1	S W	1	cloudy	
H. at a med.		29	3	11	1	2	4			Total depth	2,523
Gr. height		30	1	12	7	3	9				
L. height		28	9	9	5	1	3				

NOVEMBER 1732.

D.	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain. In, D.
1	8 a m	29	9	9	9	2	1	S	0	fair	
	5 p m	29	9	10	3	2	3	S	0	fair	
2	8 a m	29	9	10	0	2	3	S E	2	cloudy	
	5 p m	30	0	9	5	2	1	S E	1	cloudy	
3	8 a m	30	1	9	4	2	2	S E	1	fog	
	5 p m	30	1	10	0	2	2	S E	1	fog	
4	9 a m	30	1	9	5	2	2	S E	1	cloudy	
	5 p m	30	1	9	7	2	2	S E	1	cloudy	
5	9 a m	30	1	8	3	2	2	S W	0	cloudy	
	5 p m	30	1	9	0	2	3	S W	0	fair	
6	8 a m	30	2	8	2	2	4	S W	0	fair	
	5 p m	30	2	9	6	2	1	S W	0	fair	
7	8 a m	30	2	9	3	2	8	S W	2	fair	
	5 p m	30	3	9	4	2	8	S W	0	fog	
8	8 a m	30	3	8	7	3	1	W	1	fog	
	5 p m	30	3	9	2	3	3	W	1	fog	0,025
9	8 a m	30	2	9	7	3	2	W	1	fog	
	5 p m	30	1	9	9	3	0	W	0	fog	
10	9 a m	30	0	9	9	3	0	W	0	fog	
	5 p m	29	7	9	9	2	9	W	0	fog	
11	8 a m	29	6	9	1	2	8	S	1	cloudy	
	5 p m	29	5	9	5	2	8	S E	1	fair	
12	9 a m	29	6	10	4	2	9	S E	1	fog	
	4 p m	29	7	10	5	2	6	S E	1	fog	
13	9 a m	29	7	10	9	2	9	S E	1	rain	0,075
	5 p m	29	7	10	2	2	7	S E	2	fog	
14	9 a m	29	8	9	5	3	5	S E	2	cloudy	0,257
	5 p m	29	9	9	7	3	4	N W	2	cloudy	
15	9 a m	29	8	8	7	2	3	N by W	3	cloudy	0,033
	5 p m	29	8	8	4	2	0	N by W	2	cloudy	
16	9 a m	29	7	9	1	2	0	N E	3	fair	
	5 p m	29	8	8	7	1	8	N	3	fair	
											0,390

NOVEMBER 1732.

D.	Hour.	Baro. In	D.	Ther. In	D.	Hyg I.	D.	Wind. Dir.	Fon	Weather.	Rain.
											0,390
17	9 a m	29	8	8	3	1	8	W	2	fair	
	5 p m	29	4	9	5	1	7	W by S	2	fair	
18	9 a m	29	5	7	2	1	9	N W	1	fair	
	5 p m	29	5	7	4	1	9	N W	1	fair	
19	8 a m	29	4	6	7	2	0	N W	1	fair	
	4 p m	29	5	7	7	1	8	N W	3	fair	
20	9 a m	29	8	7	5	1	9	N W	1	cloudy	
	5 p m	29	9	8	3	1	7	N W	2	cloudy	
21	9 a m	30	0	7	4	2	0	N W	0	fair —	0,012
	5 p m	30	0	9	0	2	0	S	1	cloudy	
22	9 a m	30	1	10	5	2	9	S	1	cloudy	
	5 p m	30	2	10	6	3	2	S	0	cloudy	
23	9 a m	30	3	10	4	3	0	W	1	cloudy —	0,005
	5 p m	30	4	10	4	2	9	W	1	cloudy	
24	9 a m	30	4	10	4	2	7	N W	1	fair	
	4 p m	30	4	9	9	2	7	W	1	fair	
25	9 a m	30	4	9	9	2	9	W	1	fair	
	4 p m	30	4	9	6	2	9	W	1	fair	
26	9 a m	30	3	10	1	2	9	W	1	fair —	0,008
	5 p m	30	2	10	4	2	7	W	1	fair	
27	9 a m	30	0	10	1	2	8	W	1	fair	
	5 p m	30	0	9	5	2	3	N by W	1	fair	
28	9 a m	30	1	7	4	2	0	N by W	1	fair	
	5 p m	30	1	8	3	1	9	N by W	2	fair	
29	9 a m	29	8	9	9	2	5	W by S	3	cloudy	
	3 p m	29	8	10	5	2	5	W by S	3	cloudy	
30	9 a m	29	7	9	0	1	4	W	2	cloudy	
	5 p m	29	9	9	2	2	1	W	2	cloudy	
H. at a med.		29	8	9	3	2	4			Total depth	0,415
Gr. height		30	4	10	6	3	5				
L. height		29	4	7	2	1	4				

DECEMBER 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In.	D.	In.	D.	I.	D.	Dir.	For.		In D.
1	9 a m	30	1	8	2	2	3	W	2	fair	
	5 p m	30	1	8	8	2	4	W	2	fair	
2	9 a m	30	1	8	9	1	9	N W	2	fair	
	4 p m	30	1	8	7	1	9	N W	2	fair	
3	9 a m	30	1	9	0	2	0	S W	2	cloudy	
	5 p m	29	9	9	7	2	2	S W	2	cloudy	
4	9 a m	29	6	10	0	2	6	W	2	fair	
	5 p m	29	7	8	8	2	2	N W	1	fair	
5	9 a m	29	8	9	0	2	2	N	1	fair	
	5 p m	29	9	9	1	2	1	N	1	fair	
6	9 a m	30	0	8	0	2	0	N	1	fair	
	5 p m	30	0	7	7	2	5	N by W	0	fair	
7	9 a m	30	1	7	0	3	0	N	1	fair	
	5 p m	30	3	8	5	2	4	N	1	fog	
8	9 a m	30	4	9	1	2	3	E	1	fog	
	5 p m	30	4	9	1	2	3	E	1	fair	
9	9 a m	30	3	9	1	2	3	E by S	2	fair	
	5 p m	30	3	9	1	2	3	S E	2	fog —	0,032
10	9 a m	30	2	8	7	2	0	S E	2	fair	
	4 p m	30	1	9	2	2	1	S E	2	fair	
11	9 a m	29	9	7	0	2	2	S E	1	fog	
	5 p m	29	8	7	5	2	3	S E	2	fair	
12	9 a m	29	8	7	5	2	5	S E	0	fog	
	5 p m	29	8	8	0	3	5	S E	1	fog	
13	9 a m	29	9	8	5	2	6	S E	1	fog	
	5 p m	29	9	8	7	2	3	S E	0	fog	
14	9 a m	29	8	6	7	2	5	S	2	fair	
	5 p m	29	7	6	6	2	4	S	1	fair	
15	9 a m	29	7	7	4	2	4	S	1	fog	
	5 p m	29	6	7	5	3	0	S	1	fog	
16	9 a m	29	6	8	1	3	0	S E	1	fog	
	5 p m	29	6	8	4	2	5	S E	1	fair	
											0,032

DECEMBER 1732.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		
											0,032
17	9 a m	29	5	9	2	2	8	S	1	fair	
	4 p m	29	5	9	4	2	7	S	1	fair	
18	9 a m	29	4	8	8	3	1	W by S	1	fog	
	5 p m	29	4	8	1	3	1	W by S	1	fog	
19	9 a m	29	3	8	3	3	3	S by E	1	fog —	0,095
	5 p m	29	3	9	0	3	4	S by E	0	fog	
20	9 a m	29	2	9	1	3	3	S	0	fog —	0,210
	5 p m	29	1	9	5	3	2	S	0	fog	
21	9 a m	29	3	10	0	3	0	S	0	fog —	0,172
	5 p m	29	0	10	3	3	2	W	0	fog	
22	9 a m	28	9	10	0	3	4	E	2	rain —	0,395
	5 p m	29	1	9	8	3	8	E	2	rain	
23	9 a m	29	5	9	4	3	6	E	2	rain —	0,350
	5 p m	29	6	9	5	3	3	E	2	rain	
24	9 a m	29	6	10	4	3	3	S	3	rain —	0,410
	4 p m	29	5	11	8	3	0	S	3	cloudy	
25	9 a m	29	5	10	5	2	3	S W	0	cloudy	0,382
	5 p m	29	4	11	3	3	0	S W	1	cloudy	
26	9 a m	29	4	10	5	2	7	S W	1	cloudy	0,256
	4 p m	29	4	10	3	2	5	S W	1	cloudy	
27	9 a m	29	3	9	4	2	7	S W	2	cloudy	0,210
	4 p m	29	3	10	1	2	8	S W	2	cloudy	
28	9 a m	29	2	9	6	3	0	S W	2	cloudy	0,457
	5 p m	29	1	9	5	2	6	W	2	cloudy	
29	9 a m	28	8	9	0	2	7	W	2	ſnow —	0,365
	5 p m	28	6	9	8	2	5	S W	2	cloudy	
30	9 a m	28	2	10	6	2	5	S W	3	rain —	0,198
	4 p m	28	2	10	5	2	5	S W	3	cloudy	
31	9 a m	28	8	10	0	2	4	N W	2	fair —	0,085
	4 p m	29	0	9	5	2	0	W	2	fair	
H. at a med.		29	8	9	1	2	6			Total depth	3,617
Gr. height		30	4	11	8	3	8				
L. height		28	2	6	6	1	9				

JANUARY 1733.

D.	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain. In D.
1	9 a m	29	8	9	4	2	2	N W	2	fair	
	5 p m	29	6	8	6	2	1	W by N	2	fair	
2	9 a m	29	5	9	6	2	3	S W	2	rain —	0,054
	4 p m	29	3	10	6	2	5	S W	2	cloudy	
3	9 a m	29	4	9	7	2	3	S W	2	fair —	0,135
	5 p m	29	3	9	8	2	3	S W	3	cloudy	
4	9 a m	29	1	10	6	2	2	S W	3	rain —	0,217
	5 p m	29	9	11	7	2	3	S W	4	cloudy	
5	9 a m	29	2	10	6	2	0	S W	3	fair	
	5 p m	29	3	10	7	2	0	S W	2	rain	
6	9 a m	29	5	9	9	2	0	S W	2	fair —	0,190
	4 p m	29	6	10	0	2	0	S W	2	fair	
7	9 a m	29	7	10	3	2	1	S	1	fair —	0,083
	4 p m	29	6	10	2	2	0	S	2	fog	
8	9 a m	29	2	10	8	2	4	S W	1	rain	
	5 p m	29	2	10	3	2	2	W	2	fair	
9	9 a m	29	2	9	2	2	4	W	2	fair —	0,225
	5 p m	29	2	10	2	2	2	W	2	fair	
10	9 a m	29	4	9	3	2	3	W	2	fair	
	5 p m	29	5	9	5	2	1	S W	1	fair	
11	9 a m	29	5	10	0	2	2	S W	1	cloudy	
	5 p m	29	5	10	1	2	0	S W	1	cloudy	
12	9 a m	29	5	8	7	2	1	E	1	fair —	0,053
	5 p m	29	6	9	6	2	0	E	1	cloudy	
13	9 a m	29	6	9	1	2	1	S	1	fair	
	5 p m	29	6	9	4	2	0	S W	1	fair	
14	9 a m	29	6	8	3	2	2	S W	1	cloudy	
	5 p m	29	6	8	4	2	1	S W	1	fog	
15	9 a m	29	6	9	4	2	3	S	1	fair	
	5 p m	29	6	9	2	2	1	S W	2	fair	
16	9 a m	29	7	10	8	2	2	S	2	cloudy	
	5 p m	29	7	10	7	2	2	S	1	cloudy	
											0,957

JANUARY 1733.

D	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain.
											0,957
17	9 a m	29	8	10	7	2	2	S W	1	rain	
	5 p m	29	9	10	4	2	6	S W	1	raiu	
18	9 a m	30	0	10	3	2	4	S W	1	cloudy	
	5 p m	30	1	10	4	2	4	S W	2	cloudy	
19	9 a m	30	1	9	3	2	3	S	2	fair —	0,093
	5 p m	30	1	7	7	2	0	S W	1	fair	
20	9 a m	30	1	7	7	1	6	W	1	fair	
	5 p m	30	1	8	2	1	5	S	1	fair	
21	9 a m	30	2	7	0	1	7	S	1	fair	
	5 p m	30	2	8	5	1	8	S	2	fair	
22	9 a m	30	2	7	8	2	1	S E	2	fair	
	5 p m	30	2	8	2	1	9	S E	2	fair	
23	9 a m	30	1	8	4	2	2	S E	2	fair	
	5 p m	30	1	10	2	2	3	S W	2	cloudy	
24	9 a m	30	0	11	1	2	3	S W	2	cloudy	
	4 p m	30	1	11	6	2	2	S W	2	cloudy —	0,055
25	9 a m	30	0	11	1	2	2	S W	2	fair	
	5 p m	30	9	12	1	2	2	S W	3	fair	
26	9 a m	30	0	10	8	2	1	S W	3	tair	
	5 p m	30	1	11	2	2	0	S W	2	fair	
27	9 a m	30	1	10	4	2	2	S W	1	rain * —	0, 106
	4 p m	30	1	10	4	2	4	S W	2	fair	
28	9 a m	30	2	9	9	2	4	S W	1	cloudy —	0,091
	5 p m	30	1	10	2	2	3	S W	1	cloudy	
29	9 a m	29	6	10	7	2	0	S W	2	cloudy	
	5 p m	29	3	11	2	2	1	S W	3	cloudy	
30	9 a m	29	1	10	5	2	1	S W	4	fair —	0,068
	5 p m	29	3	10	1	1	9	S W	3	fair	
31	9 a m	29	0	9	1	1	9	S W	3	fair	
	5 p m	29	1	9	7	1	9	S W	2	fair	
H. at a med.		29	8	9	6	2	1			Total depth	1,370
Gr. height		30	2	12	1	2	6				
L. height		29	0	7	0	1	5				

* Rain when Mercury is at 30 1 is very extraordinary.

JANUARY 1733.

D.	Hour.	Baro. In.	D.	Ther In.	D.	Hyg. I.	D.	Wind. Dir.	For.	Weather.	Rain. In D.
1	9 a m	29	8	9	4	2	2	N W	2	fair	
	5 p m	29	6	8	6	2	1	W by N	2	fair	
2	9 a m	29	5	9	6	2	3	S W	2	rain —	0,054
	4 p m	29	3	10	6	2	5	S W	2	cloudy	
3	9 a m	29	4	9	7	2	3	S W	2	fair —	0,135
	5 p m	29	3	9	8	2	3	S W	3	cloudy	
4	9 a m	29	3	10	6	2	2	S W	3	rain —	0,217
	5 p m	29	9	11	7	2	3	S W	4	cloudy	
5	9 a m	29	2	10	6	2	0	S W	3	fair	
	5 p m	29	3	10	7	2	0	S W	2	rain	
6	9 a m	29	6	9	9	2	0	S W	2	fair —	0,190
	4 p m	29	6	10	0	2	0	S W	2	fair	
7	9 a m	29	7	10	3	2	1	S	1	fair —	0,083
	4 p m	29	6	10	2	2	0	S	2	fog	
8	9 a m	29	2	10	8	2	4	S W	1	rain	
	5 p m	29	2	10	3	2	2	W	2	fair	
9	9 a m	29	2	9	2	2	4	W	2	fair —	0,225
	5 p m	29	2	10	2	2	2	W	2	fair	
10	9 a m	29	4	9	3	2	3	W	2	fair	
	5 p m	29	5	9	5	2	1	S W	1	fair	
11	9 a m	29	5	10	0	2	2	S W	1	cloudy	
	5 p m	29	5	10	1	2	0	S W	1	cloudy	
12	9 a m	29	5	8	7	2	1	E	1	fair —	0,053
	5 p m	29	6	9	6	2	0	E	1	cloudy	
13	9 a m	29	6	9	1	2	1	S	1	fair	
	5 p m	29	6	9	4	2	0	S W	1	fair	
14	9 a m	29	6	8	3	2	2	S W	1	cloudy	
	5 p m	29	6	8	4	2	1	S W	1	fog	
15	9 a m	29	6	9	4	2	3	S	1	fair	
	5 p m	29	6	9	2	2	1	S W	2	fair	
16	9 a m	29	7	10	8	2	2	S	2	cloudy	
	5 p m	29	7	10	7	2	2	S	1	cloudy	
											0,957

JANUARY 1733.

D	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In.	D.	In.	D.	I.	D.	Dir.	For.		
											0,957
17	9 a m	29	8	10	7	2	2	S W	1	rain	
	5 p m	29	9	10	4	2	6	S W	1	rain	
18	9 a m	30	0	10	3	2	4	S W	1	cloudy	
	5 p m	30	1	10	4	2	4	S W	2	cloudy	
19	9 a m	30	1	9	3	2	3	S	2	fair —	0,093
	5 p m	30	1	7	7	2	0	S W	1	fair	
20	9 a m	30	1	7	7	1	6	W	1	fair	
	5 p m	30	1	8	2	1	5	S	1	fair	
21	9 a m	30	2	7	0	1	7	S	1	fair	
	5 p m	30	2	8	5	1	8	S	2	fair	
22	9 a m	30	2	7	8	2	1	S E	2	fair	
	5 p m	30	2	8	2	1	9	S E	2	fair	
23	9 a m	30	1	8	4	2	2	S E	2	fair	
	5 p m	30	1	10	2	2	3	S W	2	cloudy	
24	9 a m	30	0	11	1	2	3	S W	2	cloudy	
	4 p m	30	1	11	6	2	2	S W	2	cloudy —	0,055
25	9 a m	30	0	11	1	2	2	S W	2	fair	
	5 p m	30	9	12	1	2	2	S W	3	fair	
26	9 a m	30	0	10	8	2	1	S W	3	tair	
	5 p m	30	1	11	2	2	0	S W	2	tair	
27	9 a m	30	1	10	4	2	2	S W	1	rain * —	0, 106
	4 p m	30	1	10	4	2	4	S W	2	fair	
28	9 a m	30	2	9	9	2	4	S W	1	cloudy —	0,091
	5 p m	30	1	10	2	2	3	S W	1	cloudy	
29	9 a m	29	6	10	7	2	0	S W	2	cloudy	
	5 p m	29	3	11	2	2	1	S W	3	cloudy	
30	9 a m	29	1	10	5	2	1	S W	4	fair —	0,068
	5 p m	29	3	10	1	1	9	S W	3	fair	
31	9 a m	29	0	9	1	1	9	S W	3	fair	
	5 p m	29	1	9	7	1	9	S W	2	fair	
H. at a med.		29	8	9	6	2	1			Total depth	1,370
Gr. height		30	2	12	2	2	6				
L. height		29	0	7	0	1	5				

* Rain when Mercury is at 30 1 is very extraordinary.

FEBRUARY 1733.

D.	Hour.	Baro In.	Baro D.	Ther. In.	Ther. D.	Hyg. I	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain. In D.
1	9 a m	29	2	10	6	2	2	S W	4	rain —	0,135
	5 p m	29	1	11	4	2	2	S W	4	rain	
2	9 a m	28	9	10	1	2	2	S W	2	cloudy —	0,193
	5 p m	29	0	9	2	2	3	S W	2	cloudy	
3	9 a m	29	2	9	7	2	1	S W	3	fair —	0,233
	5 p m	29	1	9	8	2	1	S W	2	fair	
4	9 a m	28	9	9	5	2	1	S W	3	fair —	0,089
	4 p m	28	8	10	0	1	7	S W	3	cloudy	
5	9 a m	29	0	9	6	2	0	W	2	fair	
	5 p m	29	4	10	6	1	8	N W	2	fair —	0,063
6	9 a m	29	8	9	2	2	3	W	2	fair	
	5 p m	29	8	10	3	2	2	S W	2	cloudy	
7	9 a m	29	6	10	8	2	2	S W	2	cloudy	
	5 p m	29	6	10	6	2	0	W	2	rain	
8	9 a m	29	4	9	5	2	2	E	1	rain	
	5 p m	29	3	8	8	3	0	N E	3	rain	
9	9 a m	29	4	9	0	2	6	N	2	fair —	0,514
	5 p m	29	5	9	6	2	0	N	1	fair	
10	9 a m	29	6	8	5	2	4	N	1	fair	
	5 p m	29	6	10	0	2	3	W	2	fair	
11	9 a m	29	3	11	3	2	5	S W	3	cloudy	
	5 p m	29	3	11	0	2	3	W	3	cloudy	
12	9 a m	29	5	9	4	2	2	S W	3	cloudy	
	5 p m	29	6	10	3	2	1	W	3	cloudy	
13	9 a m	29	4	11	2	2	2	S W	3	fair	
	5 p m	29	4	11	7	2	0	S W	3	cloudy	
14	9 a m	29	6	9	8	2	1	S W	2	fair	
	5 p m	29	7	10	3	1	8	W	2	fair	
15	9 a m	29	8	9	7	2	2	S W	2	fair —	0,137
	5 p m	29	8	10	7	2	0	S W	2	fair	
16	9 a m	29	8	10	7	2	2	S W	2	fair	
	5 p m	29	7	11	5	1	9	S W	3	cloudy	
											1,334

FEBRUARY 1733.

D	Hours	Baro. In.	D.	Ther In.	D	Hyg I.	D.	Wind. Dir.	For.	Weather.	Rain.
											1,334
17	9 a m	29	8	9	5	2	0	S W	3	fair	
	5 p m	29	7	10	7	2	0	S W	3	fair	
18	9 a m	29	7	11	1	2	0	S W	2	cloudy	
	5 p m	29	6	10	8	1	8	S W	2	fair	
19	9 a m	29	3	10	3	1	9	S E	2	cloudy	0,092
	5 p m	29	4	9	3	1	9	S W	2	cloudy	
20	9 a m	29	3	9	3	2	1	S E	2	rain	0,373
	5 p m	29	3	9	5	2	4	S E	2	rain	
21	9 a m	29	3	9	5	2	6	S W	1	cloudy	
	5 p m	29	4	10	2	2	5	S W	1	cloudy	
22	9 a m	29	4	9	5	2	3	S	3	fair	0,315
	5 p m	29	4	10	1	2	0	S W	4	cloudy	
23	9 a m	29	2	9	6	1	4	S E	2	cloudy	0,142
	5 p m	29	4	10	2	2	1	S E	2	cloudy	
24	9 a m	29	6	10	0	2	2	S E	1	cloudy	
	5 p m	29	7	10	7	1	8	S W	1	cloudy	
25	9 a m	29	5	9	8	2	0	W	2	fair	0,094
	5 p m	29	7	9	4	2	0	W	3	fair	
26	9 a m	29	4	10	3	2	1	S W	4	rain	0,110
	5 p m	29	4	9	7	1	8	S W	2	cloudy	
27	9 a m	29	4	9	3	2	0	S W	3	rain	
	5 p m	29	4	8	6	2	2	S W	2	ſnow	
28	9 a m	29	6	9	8	2	2	S W	2	cloudy	0,065
	5 p m	29	5	11	1	2	0	S W	2	cloudy	
H. at a med.		29	6	9	9	2	1			Total depth	2,525
Gr. height		29	8	11	7	3	0				
L. height		28	8	8	5	1	4				

MARCH 1733.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In.	D	In	D.	I.	D.	Dir.	For.		In D.
1	9 a m	29	7	11	8	2	4	S W	2	cloudy —	0,035
	5 p m	29	5	11	9	2	0	S W	4	cloudy	
2	9 a m	29	6	10	5	2	1	S W	2	cloudy	
	5 p m	29	9	10	2	1	7	N	3	fair —	0,073
3	9 a m	30	2	9	4	2	2	W	3	fair	
	5 p m	30	2	10	8	1	5	W	2	fair —	0,042
4	9 a m	30	2	10	6	2	4	W	2	fair	
	5 p m	30	1	11	0	2	1	W	2	fair	
5	9 a m	29	9	11	0	2	3	N W	3	fair	
	5 p m	29	9	9	7	1	7	N W	2	fair	
6	9 a m	29	9	9	8	2	1	N W	2	fair	0,100
	5 p m	29	8	10	0	1	9	W	2	fair	
7	9 a m	29	3	9	4	2	2	S W	3	rain —	0,072
	5 p m	29	2	10	0	1	6	W	2	cloudy	
8	9 a m	29	2	8	9	2	0	N W	3	fair	
	5 p m	29	4	9	1	1	7	N W	2	cloudy —	0,254
9	9 a m	29	5	8	2	1	5	N W	2	fair	
	5 p m	29	6	8	1	1	5	N W	2	fair —	0,05[illegible]
10	9 a m	29	7	8	4	1	6	N W	2	cloudy	
	6 p m	29	7	8	0	2	4	N	1	ſnow	
11	9 a m	29	7	7	6	2	3	N	1	fair	
	6 p m	29	6	9	0	2	0	N E	1	cloudy —	0,151
12	9 a m	29	7	8	8	2	6	S E	2	rain	
	5 p m	29	8	9	7	2	5	S E	2	cloudy	
13	9 a m	30	0	9	1	2	2	E	2	hazy —	0,096
	6 p m	29	9	9	0	2	3	E	2	hazy	
14	9 a m	29	8	9	0	2	1	S E	1	hazy	
	5 p m	29	6	9	7	1	7	S E	2	fair	
15	9 a m	29	5	8	9	1	8	S E	2	hazy —	0,194
	5 p m	29	4	8	7	1	8	S	2	cloudy	
16	9 a m	29	1	8	5	2	5	S E	3	ſnow —	0,210
	5 p m	29	1	9	4	2	6	S E	3	rain	
											1,277

MARCH 1733.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		
											1,277
17	9 a m	29	2	9	5	2	6	S E	1	hazy	
	5 p m	29	2	9	4	2	5	S E	2	rain	
18	9 a m	29	3	9	1	2	5	S E	3	fair —	0,292
	6 p m	29	4	8	9	2	6	S E	2	cloudy	
19	9 a m	29	4	9	2	2	2	N	1	fair	
	5 p m	29	4	8	9	2	0	N E	3	hazy	
20	9 a m	29	3	7	6	3	8	N E	4	ſnow	
	5 p m	29	3	8	3	4	0	E	2	cloudy	
21	9 a m	29	2	7	9	3	2	S W	2	fair —	0,520
	6 p m	29	1	7	4	2	5	S W	2	fair	
22	9 a m	29	1	8	7	3	0	E	2	cloudy	
	5 m	29	1	8	5	3	0	N	2	hazy	
23	9 a m	29	4	8	7	3	2	N	2	cloudy —	0,128
	5 p m	29	4	9	5	2	9	S E	2	rain	
24	9 a m	29	3	9	6	3	1	S E	2	rain —	0,070
	5 p m	29	2	2	1	2	6	S E	2	fair	
25	9 a m	29	3	11	3	2	8	S	1	fair	
	5 p m	29	4	12	5	1	8	S	1	fair —	0,130
26	9 a m	29	4	10	3	3	9	E	2	miſt	
	5 p m	29	3	10	3	3	4	E	2	miſt —	0,054
27	9 a m	29	4	11	3	3	5	S	1	fair	
	5 p m	29	4	11	4	2	3	S	1	cloudy	
28	9 a m	29	5	12	0	2	5	S E	1	cloudy	
	5 p m	29	5	12	4	2	2	S E	2	cloudy	
29	9 a m	29	6	11	0	3	0	E	2	hazy	
	5 p m	29	7	11	4	3	2	E	2	rain	
30	9 a m	29	9	10	5	2	8	E by N	2	cloudy	
	7 p m	29	9	10	2	2	9	E by N	2	fair	
31	9 a m	29	9	11	5	2	6	E by N	0	fair —	0,177
H at a med.		29	6	9	9	2	4			Total depth	2,638
Gr. height		30	2	12	5	3	9				
L. height		29	1	7	4	1	5				

APRIL 1733.

D.	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In.	D.	In.	D.	I.	D.	Dir.	For.		In D.
1	9 a m	29	9	1	2	2	9	N E	1	mist	
	5 p m	29	9	12	6	2	6	N E	0	mist	
2	9 a m	29	9	12	5	2	4	N	1	cloudy	
	7 p m	29	9	12	7	1	7	N	0	fair	
3	9 a m	30	0	12	0	1	8	N W	2	fair	
	5 p m	30	0	13	0	1	7	N W	1	cloudy	
4	9 a m	30	1	10	8	2	8	N	0	mist	
	7 p m	30	1	10	3	2	9	N	2	mist	
5	9 a m	30	1	12	7	1	8	N E	1	mist	
	7 p m	30	1	12	7	1	8	N	2	fair	
6	8 a m	30	1	11	9	1	7	S W	1	fair	
	7 p m	29	9	13	1	1	5	N	1	fair	
7	9 a m	29	9	11	6	1	8	S W	0	fair	
	7 p m	29	8	11	8	1	5	S W	1	fair	
8	9 a m	29	6	12	5	1	6	S	2	cloudy	
	7 p m	29	5	11	9	1	8	S W	1	drizling	
9	8 a m	29	6	11	9	1	8	W by S	2	fair	
	7 p m	29	6	11	8	1	4	W	2	fair	
10	8 a m	29	6	11	6	1	5	S W	3	fair	
	7 p m	29	6	12	0	1	5	S W	1	cloudy	
11	9 a m	29	6	11	6	1	6	S W	2	fair	0,023
	7 p m	29	5	11	5	1	6	S	2	cloudy	
12	9 a m	29	5	12	2	1	7	S	2	cloudy	
	7 p m	9	5	11	7	1	7	S	2	cloudy	
13	9 a m	29	4	12	6	1	7	S E	1	fair	
	7 p m	29	4	11	7	2	1	E	1	fog	
14	9 a m	29	4	11	8	2	3	S E	2	cloudy	0,055
	7 p m	9	6	11	0	1	9	S E	2	cloudy	
15	9 a m	29	8	11	3	2	0	E	1	fair	
	7 p m	29	9	10	7	2	5	E	2	cloudy	
16	9 a m	30	0	10	8	3	0	N E	2	fair	
	7 p m	30	0	10	6	2	4	N E	2	fair	
											0,078

APRIL 1733.

D	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In.	D.	I.	D.	Dir.	For.		
											0,078
17	9 a m	29	8	10	7	2	9	N E	3	fog	0,073
	7 p m	29	7	11	0	2	7	N E	2	fog	
18	9 a m	29	5	10	7	3	0	N E	2	fog	
	7 p m	29	2	10	5	3	7	N E	3	rain	
19	9 a m	29	3	11	2	3	4	S	2	cloudy	0,187
	7 p m	29	5	12	6	2	1	S	1	fair	
20	9 a m	29	7	12	2	2	3	S	1	cloudy	
	8 p m	29	8	12	4	2	1	W	1	rain	
21	9 a m	29	9	12	1	2	1	S W	1	fair	
	8 p m	29	8	11	9	2	0	E	1	fair	
22	9 a m	29	8	11	4	2	0	E	2	fair	
	5 p m	29	8	11	9	2	1	E	2	cloudy	
23	9 a m	29	8	10	7	2	3	N E	2	cloudy	
	7 p m	29	7	10	6	3	5	N E	3	cloudy	
24	9 a m	29	7	10	4	2	6	N E	3	cloudy	0,262
	4 p m	29	8	10	8	2	0	N E	2	fair	
25	9 a m	29	9	10	5	2	0	N E	2	fair	
	5 p m	29	9	11	5	1	7	N E	2	cloudy	
26	9 a m	29	9	10	4	1	8	N E	2	fair	0,095
	5 p m	29	9	11	1	1	6	N E	2	fair	
27	9 a m	29	0	10	9	1	8	N	2	fair	
	5 p m	29	9	12	6	1	4	N	1	cloudy	
28	9 a m	30	0	10	9	2	0	N E	2	cloudy	
	7 p m	30	1	11	4	2	0	N E	1	cloudy	
29	9 a m	30	1	12	4	1	9	N W	2	fair	
	5 p m	30	1	13	4	1	4	N W	2	fair	
30	9 a m	30	2	11	7	1	6	E	1	cloudy	0,195
	8 p m	30	2	11	8	1	5	E	1	cloudy	
H. at a med.		29	7	11	6	2	0			Total depth	0,818
Gr. height		30	2	13	4	3	7				
L. height		29	2	10	3	1	4				

MAY 1733.

D	Hour.	Baro.		Ther.		Hyg.		Wind.		Weather.	Rain.
		In	D.	In	D.	I.	D.	Dir.	For.		In D.
1	9 a m	30	1	12	2	1	6	W	1	cloudy	
	5 p m	30	0	13	7	1	4	W	2	fair	
2	7 a m	29	9	12	6	1	6	W	1	fair	
	6 p m	29	8	12	8	1	5	E	2	cloudy	
3	9 a m	29	8	12	1	2	1	E	2	fair	
	5 p m	29	8	10	7	2	3	E	2	cloudy	
4	8 a m	29	9	11	4	1	5	E	1	fair	
	8 p m	29	9	11	1	1	5	E	1	fair	
5	9 a m	30	0	11	2	1	5	E	1	fair	
	8 p m	29	9	12	4	1	4	E	1	fair	
6	8 a m	29	9	11	2	1	6	E by N	2	fair	
	4 p m	29	8	13	0	1	4	E by N	2	fair	
7	8 a m	29	6	11	6	1	5	S E	2	fair	
	5 p m	29	6	13	4	1	2	S E	2	fair	
8	9 a m	29	6	10	7	1	4	N E	1	cloudy	
	6 p m	29	6	12	3	1	3	N E	2	cloudy	
9	8 a m	29	6	11	7	1	4	N E	2	fair	
11	9 a m	29	7	12	9	1	3	E	1	fair	
	5 p m	29	7	13	4	1	4	E	1	fair	
12	9 a m	29	7	12	3	1	3	E	1	fair	
	5 p m	29	7	13	8	1	2	E	1	fair	
13	9 a m	29	8	12	8	1	4	E	1	fair	
	6 p m	29	9	13	1	1	3	N E	1	fair	
14	9 a m	29	9	12	7	1	7	N E	1	fair	
	6 p m	29	9	13	3	1	6	E	2	fair	
15	9 a m	30	0	12	5	1	6	E	2	fair	
	8 p m	30	0	12	9	1	3	E	1	fair	
16	9 a m	30	0	13	2	1	4	S E	1	fair	
	8 p m	30	0	12	2	1	5	E	1	fair	

MAY 1733.

D	Hour.	Baro. In.	Baro. D.	Ther. In.	Ther. D.	Hyg. I.	Hyg. D.	Wind. Dir.	Wind. For.	Weather.	Rain.
17	9 a m	30	0	12	3	1	7	E	1	fair	
	6 p m	29	9	12	7	1	8	E	1	fair	
18	9 a m	29	9	12	4	2	2	E	1	rain	
	6 p m	29	9	12	9	1	8	E	1	cloudy	
19	9 a m	29	9	12	6	1	8	E	1	cloudy	0,032
	6 p m	29	8	13	5	1	3	S W	0	cloudy	
20	9 a m	29	8	13	3	1	6	W	2	cloudy	
	7 p m	29	8	12	8	1	4	W	2	cloudy	
21	8 a m	29	9	13	2	1	5	W	2	fair	
	7 p m	29	9	13	2	1	3	W	2	cloudy	
22	9 a m	29	9	13	2	1	9	W	1	cloudy	
	7 p m	29	9	14	0	1	1	W	2	fair	
23	9 a m	30	1	14	0	1	5	N W	2	fair	
	8 p m	30	1	13	7	1	4	N	2	fair	
24	8 a m	30	1	12	5	1	6	E	2	fair	
	8 p m	30	1	12	0	1	7	E	2	cloudy	
25	9 a m	30	0	12	3	1	4	E by N	2	cloudy	0,045
	8 p m	29	9	11	6	1	6	E by N	2	cloudy	
26	9 a m	29	9	12	0	2	5	N E	2	cloudy	
	8 p m	30	1	12	2	2	5	N E	2	cloudy	
27	9 a m	30	1	12	0	3	1	NE	1	cloudy	
	7 p m	30	2	12	7	2	5	N E	2	fair	
28	9 a m	30	1	13	8	2	0	N E	0	fair	
	7 p m	30	0	5	9	1	1	N E	0	fair	
29	9 a m	29	9	15	3	1	3	N	1	fair	
	9 p m	29	9	13	4	1	6	E	1	cloudy	
30	9 a m	29	8	12	9	1	3	E	1	fair	0,006
	8 p m	29	8	12	8	1	3	E	1	fair	
31	9 a m	29	7	14	1	1	3	N W	2	fair	
	8 p m	29	8	12	2	1	2	N	2	fair	
	H. at a med	29	8	12	7	1	5			Total depth	0,083
	Gr. height	30	2	15	9	3	1				
	L. height	29	9	10	7	1	1				

II. *An Account of the DISEASES that were moſt frequent laſt Year in* Edinburgh.

THE tertian agues, which were mentioned in the cloſe of our preceeding year, continued likewiſe through June, and part of July 1732. Towards the end of June this diſeaſe did not form into regular paroxyſms, and perfect intermiſſions, but appeared more in the ſhape of a remitting fever. During the remiſſions, the pulſe was much ſunk; but, as the ſweat came on, the pulſe became fuller and ſtronger. When the ſweat did not break out, the patients became delirious, and ſome continued quite deaf for ſome days. The urine was pale, and without ſediment, till the diſeaſe was going off.

Some were cured of this diſeaſe after two or three paroxyſms, by a vomit or two; but, with others, the diſeaſe laſted much longer. Bleeding was not found of uſe, although ſome ſymptoms ſeemed to require it; but vomiting and bliſtering ſucceeded much better, either of them bringing out the ſweat when untimely ſtopt or prevented.

In July ſome few tertian agues remained; they were then more regular and gentle than before. Towards the end of this month the cholera began to appear; but it was neither very frequent nor violent.

In Auguſt many among the poorer ſort of people in the ſuburbs and villages near Edinburgh, were taken with ſlow fevers, generally attended with a violent head-ach and ravings;

ſome with a diarrhœa, others with pains of the rheumatic kind all over the body. As few of the ſick had acceſs to timely aſſiſtance, ſeveral died in this diſtemper.

The ſame fever continued among the poorer people through September and October, and proved mortal the eighth or ninth day. Beſides the ſymptoms before mentioned, many complained of great weight of their heads, and drowſineſs, loathing and vomiting; others had pains of the breaſt, and difficult breathing. Children in this fever, beſide the head-ach and drowſineſs, had pain and tenſe ſwelling of the belly. Moſt of them paſſed worms, ſome the teretes, others the aſcarides, and recovered.

In November ſeveral children were ſeized with ſlight aguiſh fits, returning every other day, but laſting only a few hours, and going off without ſweating. Between the paroxyſms the children were pretty eaſy, and their pulſes calm. Theſe fits were eaſily carried off by a vomit or two.

About the ſame time ſeveral people were taken with a cholera, which did not prove very obſtinate.

In this month likewiſe the effects of cold appeared in different ſhapes, as coughs, quincys, rheumatic pains, colic-pains, diarrhœas, &c.

From the beginning till the middle of December, ſlow fevers were very rife among young people; they continued long, and were attended with pains in the breaſt, and a ſymptomatic diarrhœa, but were not deadly. About the ſame time others were ſeized with fevers of the nervous kind, with a very frequent, but low pulſe.

On the 17th December, ſeveral people were ſuddenly attacked with fevers of cold; the numbers increaſed but inſenſibly till the 25th; after which theſe fevers became greatly epidemic, very few eſcaping them, and continued univerſal in this city and neighbourhood till the middle of January 1733, when they began to decreaſe, and diminiſhed daily till the end of that month.

This fever began with a coldneſs, ſhivering, ſwimming of the head, pains of the head, breaſt, and back; the pulſe was very frequent; the appetite quite loſt, and remained palled ſome time after the diſeaſe was removed. With a great many it began with a running of lymph at the eyes and noſe, which continued for a day; then they complained of pain and ſwelling about their throats before the cough began, and not a few were ſuddenly ſeized with the cough, which, after the third day, was inceſſant and conſtant in all, by which they diſcharged great quantities of mucus, and had their pains greatly increaſed. Some complained of ſharp pains in their bellies, and had a diarrhœa, ſometimes with bloody ſtools, eſpecially if they were not ſufficiently blooded in the beginning. Several paſſed their urine in very ſmall quantity, of a high colour, without ſediment, and continued to do ſo ſome time after the fever was gone off. Among the children, along with the cough, many had violent vomitings, and ſome a gentle diarrhoea, which carried off the diſeaſe.

The fever commonly left the ſick in two or three days; but, after the third day, ſcarce any eſcaped the conſtant tickling cough. Generally all of them inclined to ſweat, and were thereby conſiderably relieved. Some had profuſe ſweats, with copious reddiſh or brown, but not lateritious ſediment in their urine, without any previous coldneſs, ſhiverings, &c. Theſe ſoon did well, if the ſweating was not diſcouraged by ſome other evacuation.

Bleeding in the beginning gave relief to the pains, and weakened the fever, and required to be plentiful to many who had violent head-aches, and a feeling in their eyes as if they would have ſtarted out, or to thoſe who had an univerſal oppreſſion of the thorax, with ſtitches and cramps of the muſcles employed in breathing; ſuch in this condition who delayed venæſection too long, were ſeized with a hæmoptoe. Some bled a little at the noſe, and were quickly well, without any medicine or other evacuation. A few were at once ſeized with ugly faintings; when bled they recovered more ſlowly; but, when ſupported with cordials, they were ſoon well.

Veſicatories were of ſervice to the cough, and opiates were of great uſe, curing ſeveral.

When the phlegm began to thicken, mixtures in which gum-ammoniac and oxymel ſcilliticum were the principal ingredients, opened the belly, and did remarkable ſervice. The ordinary pectorals and balſamics were not obſerved to do any good.

This diſeaſe was not of itſelf mortal, but it ſwept away a great number of poor old and conſumptive people, and of thoſe who were much waſted by other diſtempers. As a proof on whom it fell heavieſt, we may remark, That, though the number of burials in the Grayfriars church-yard (where all the dead of Edinburgh are buried) was double of what it uſes to be in the month of January; yet the number of thoſe who were buried at the public charge, was ſo great, that the fees of the burials ſcarce did amount to the ſum commonly received in any other month.

It was very remarkable, That, notwithſtanding this diſeaſe was ſo univerſal here, the people in our priſon, and the boys, who are numerous, in Heriot's hoſpital, which is contiguous to the Weſt ſide of the Grayfriars church-yard, and the inhabitants of the houſes near to that hoſpital, eſcaped this fever and cough.

This epidemic diſeaſe, which was felt ſooner at Edinburgh than any other part of this iſland, ſpread itſelf gradually over all Scotland. It did not reach the moſt northern and weſtern parts, till about fifteen days after the time above mentioned of its attacking this city. The ſhip Anne and Agnes, David Littlejohn maſter, having made a voyage to Holland, with one ſick ſailor on board, returned with the other ten in perfect good health, till they made Flamborough-head, where, on the 15th of January, ſix ſailors were taken ill; next day two more were in the ſame condition, and the day thereafter one more fell ſick; ſo that, when the veſſel came to the road of Leith, none on board were in health except one, who was ſeized the day after he came on ſhore with the ſame diſeaſe which his comerades had, whoſe ſymptoms were the common ones of the raging epidemic diſtemper.

We believe it will not be improper here to mention the horſes in and about this place, being univerſally attacked with a running of the noſe and coughs, towards the end of October and beginning of November, before the appearance of this fever of cold among men.

This epidemic diſtemper above deſcribed, ſpread itſelf over all Europe, and alſo infeſted the inhabitants of America; ſo that it was perhaps the moſt univerſal diſeaſe upon record. The firſt accounts we have of any thing like it this laſt year in Europe, was in the middle of November, from Saxony, Hanover, and other neighbouring countries in Germany. It raged at one time in Edinburgh, and Baſil in Switzerland. It appeared in London and Flanders after the firſt week in January. Toward the middle of which it reached Paris; and, about the end of the ſame month, Ireland began to ſuffer. In the middle of February Leghorn was attacked; and near the end of it, the people of Naples and Madrid were ſeized with it. In America it began in New-England about the middle of October, and travelled ſouthward to Barbadoes, Jamaica, Peru, and Mexico, much at the ſame rate as it did in Europe.

There were alſo ſome people in Edinburgh labouring under the fevers of the pleuritic kind, and others under ſlow tedious ones in the month of January.

In February rheumatic and pleuritic fevers ſucceeded to the colds, ſeveral who had paſſed through theſe were ſeized with thoſe and died. The management of the ſick was no other than what is common in pleuriſies.

About this time alſo ſeveral people died ſuddenly.

The pleuritic or peripneumonic fevers, which began in February, continued through all March.

At the ſame time ſlow fevers were likewiſe frequent without any topical inflammation. In moſt patients theſe fevers did not appear with any violent ſymptoms, tho' ſome had ravings, but they were neither conſtant nor high. Theſe fevers often laſted till the 30th or 40th day, and in ſome to the 60th; and at length the patients gradually wreſtled out of them, without any remarkable criſis. The common remedies in ſuch caſes availed little here; bliſtering was found of much more ſervice than bleeding.

Tertian agues began to appear in March, and continued thro' April and part of May, tho' not very frequent; many of them went off eaſily after four or five fits, without much aſſiſtance from medicine, others took the common courſe.

Some ſhort but ſharp fevers were frequent in April, with an eryſipelas for the moſt part on the face, and ſometimes on the body or extremities.

Some few children had the ſmall pox all the ſpring, and there were rather more in May; they were generally of the diſtinct kind; and ſeveral had an eruption like the baſtard or chicken-pox. It was attended with very little fever, and very ſlight ſymptoms; for, after a little heavineſs and loſs of appetite, the puſtules appeared. They were pretty large and red: They did not ſuppurate, but had a little veſicle of clear lymph on the top. Some new puſtules appeared for four or five days ſucceſſively like the firſt; and about the ninth day all went off.

III. *An Extract from the public Regiſter of Burials in* Edinburgh.

1732.	Men	Women.	Child.	Still-born	Sum.
June -	23	32	27	0	82
July - -	16	21	37	5	79
Auguſt -	19	20	39	2	80
September	15	32	20	4	71
October	20	19	32	4	75
November	24	28	33	4	89
December	31	41	34	3	109
1733.					
January	56	81	74	3	214
February	40	44	48	3	135
March -	36	42	34	5	117
April -	20	28	41	2	91
May - -	19	26	57	3	105
Total	319	414	476	38	1247

IV. *An Eſſay on penetrating topic Medicines; by* JOHN ARMSTRONG, *M. D. Phyſician at* London.

IT does not ſeem ſtrange that medicines ſhould, according to their various powers, affect the ſolids and fluids to which they are immediately

ately applied. Neither is it hard to conceive by what means ſuch particles as are capable to enter the abſorbent veſſels, ſhould reach any part of the human body that lies (as all its parts in a ſound ſtate do) in the road of the circulation. But by what ſecret ways external medicines are immediately communicated to the remoter ſubſtance of the parts to which they are applied, and how, by that means, they contribute to remove diſeaſes that have for their ſeats the ligaments of the bones, or ſuch other parts as ſeem not to be acceſſible from without, is an inquiry that ſeems to have been hitherto pretty much neglected. It is a very common way of talking upon this ſubject, That this or that medicine penetrates the pores; but I am not ſo certain, that the ideas commonly joined to ſuch expreſſions are very diſtinct: For no writer of my acquaintance that has handled this ſubject, has taken the pains to explain himſelf ſo far as to tell us what pores he means, which has induced me to venture the laying before you a few conjectures concerning the ways by which topical medicines are conveyed into the ſubſtance of the parts to which they are applied, directing my principal aim to the conſideration of thoſe that tend to the reſolving of obſtructions of the remoter veſſels.

I need not here enter into any diſquiſition concerning the nature and ſeat of obſtructions, nor from thence explain the indications of relaxing the obſtructed ſmall arteries, and of attenuating the obſtructing matter: This is what may be learned in ſeveral books, and is moſt methodically treated in that elegant chapter of Boerhaave's Aphoriſms *de obſtruct.* Allow me only to mention, that the medicines of which I now treat are ſuch, as by the ſmallneſs and mobility of their particles, attended for the moſt part with a gentle acrimony, are able to make their way into the ſubſtance of the parts to which they are applied, without eroding or wounding any of the ſolids, and thence are juſtly enough named *penetrating topics*.

That the effects of ſuch medicines are not owing to the particles of them, which enter into the orifices of the abſorbent veins that are every where on the ſurface of the body, ſeems to me plain from their not being applied, on this ſuppoſition, to the obſtructing matter, till they have been mixed with all the maſs of blood; and therefore an exceeding ſmall proportion of them can never arrive at the obſtructed arteries; beſides, if this was the caſe, theſe medicines would have as great, if not greater effects when applied to the ſound parts of the body, than to the diſeaſed part, which daily experience ſhews they have not.

I can as little allow all the effect of theſe medicines to depend on their opening the orifices of the exhalant veſſels on the ſurface of the body, which ſome might ſuppoſe always obſtructed when the more internal ones are blocked up; and therefore would alledge, that the fluids, having regained their paſſage by the exterior veſſels, will exert a leſs momentum on the interior, the obſtruction of which comes conſequently to be reſolved; I cannot, I ſay, allow this account to be juſt, becauſe by other medicines, the emollients for inſtance, the obſtruction of the exterior veſſels can be equally well removed; but theſe have not the power of reſolving deep-ſeated obſtructions, which they would have equally with the claſs of medicines of which I treat, if the above reaſoning was juſt.

Nor can I imagine the ſubtile particles of the penetrating topics capable of forcing their way through the coats of numerous veſſels, where we can ſcarce ſuppoſe pores by which they ſhould paſs, without hazard of the finer particles of our fluids eſcaping out at the ſame paſſages by which the medicines entered, which would produce a great train of bad conſequences.

Previous to my opinion of this matter, it will be neceſſary to obſerve, that though the ſmall arteries of the body cannot admit any thing at their ſmall extremities to paſs backwards towards their larger trunks, as long as the force of circulation continues to propel the liquors towards their extremities; yet, when that propelling force does not act, they will, like other empty tubes, admit ſubſtances at either extremity; and, where-ever they are ſmall enough, they will exert the ſame power of raiſing liquors in them, as other capillary tubes do. Beſides, what reaſon dictates to us in proof of this, we have it finely illuſtrated and confirmed by Mr Hales's experiments of the motion of the ſap or juices imbibed at either extremity of vegetables.

are conveyed by the exhalant veſſels of the ſkin, to thoſe parts of the ſmaller arteries, where the circulation is choaked by obſtruction, which I conceive to be thus accompliſhed. The places where the arterious veſſels are moſt liable to be obſtructed, are where they are ſtraiteſt; that is, where they are about to join their analogous veins; and the ſmaller any branch of any artery is, the more ſubject it is, *cæteris paribus*, to obſtruction. It does not ſeem improbable then that the branches of arteries, diſtributed to the more ſolid parts, immediately before they deliver their contents to their correſponding veins, ſend off an exhalant veſſel to the ſkin, by which a ſeparation is made of the moſt acrid exalted parts of their fluids, which hitherto may have been uſeful, by their inciding acrimony, to promote a free paſſage through theſe dangerous ſtraits; but, by acquiring ſtill a greater ſharpneſs, would be noxious in another circulation. This I preſume is agreeable enough to the moſt approved theory of obſtruction, ſecretion, and perſpiration. Now, ſuppoſe an obſtruction formed in ſuch a ſmall artery, above the place where it detaches its exhalant branch, here is a ſtop put to the progreſs of the fluids through this veſſel; its perſpiratory duct becomes empty; and for this time it is as pervious from without as an abſorbent vein: Thus it may admit, as far as the obſtructed point, the ſmaller particles of applications, whether ſuch as are properly called penetrating or emollient, by whoſe attenuating, ſtimulating, and relaxing powers, the obſtructed matter is at laſt reſolved and

looſened,

looſened, and the damm'd up fluids following with a great guſh, partly return by the vein, and partly make their exit by the excretory tube. Thus when a great number of ſmall arteries, neighbouring one another, are obſtructed and wedged cloſe together, as ſoon as a few of them are, by the means above mentioned, unlocked, the reſt will crowd each other leſs, and will be more at liberty to yield to the force of the urgent ſtream: So that, by this increaſed laxity, and the continued and repeated application of the ſame reſolving powers, the whole bulk of obſtructed veſſels is by degrees opened.

After the ſame manner, when ſome of the larger kinds of arteries are obſtructed, the more ſubtile particles of external medicines may be conceived to gain acceſs, by a great number of conduits, to the places where the obſtruction is formed, if, betwixt theſe points and the riſe of the exhalant veſſels, they have no anaſtomoſes with other branches. And perhaps theſe mutual communications are not ſo frequent in the capillary veſſels as ſome give out. This is confirmed by Mr Hales's hæmaſt. Exper. 9.

This doctrine may perhaps receive ſome illuſtration from ſome phænomena that ordinarily attend ſeveral topical diſeaſes, particularly the gout, whoſe *cauſa proxima* is, according to the moſt plauſible accounts, an obſtruction of the ſmall arterious veſſels diſtributed to the ligaments of the bones, the tendons, and their ligaments. 'Tis well known, that, all the time this diſeaſe exerts its rage, the ſkin of the parts affected is remarkably dry, which, no doubt, is owing to the diminiſhed perſpiration; and this dryneſs happens when the pain is not attended with any tumour, and therefore cannot be imputed to any compreſſion made upon the perſpiratory ducts. But, as ſoon as the broken lentor begins to thaw from ſome of the veſſels, the ſkin of the part is ſeized with a keen itching, from the morbid matter, grown acrid by a long ſtagnation and attrition, ruſhing through the veſſels of perſpiration contracted to their leaſt capacity, till at laſt this ſame matter, together with that ſharp thin fluid which naturally is diſcharged this way, pouring into theſe veſſels in greater quantities, dilates them more and more, and drills out in form of ſweat, while the cuticular ſcales, dried and ſhrunk for having been ſo long deprived of moiſture, fall off in great abundance.

But beſides this, there is perhaps ſtill another way by which external medicines are conveyed to the more diſtant veſſels; that is, by inſinuating themſelves between the interſtices of the canals. And though, in this way, they cannot, according to our hypotheſis, act immediately on the ſtagnant fluids, except ſuch as are extravaſated, yet they may be conceived as effectually to ſtimulate or relax the obſtructed veſſels, as thoſe that enter their cavities.

Tho' I ſaid before, (and gave a reaſon for ſaying), that it did not ſeem very probable, that the particles of medicines, however ſubtile, could penetrate through the coats of the blood-veſſels into their cavities; yet it is not, as I apprehend, inconſiſtent with this opinion, to allow their finding a paſſage through that rarer texture of ſmall veſſels, which fills up the interſtices of the larger ones, and connects them looſely together: For it does not appear that theſe tubes, which do not conſpire to the forming of a larger veſſel, are ſo cloſely twiſted together as the *vaſa vaſorum*, or thoſe that do: And that the ſubſtance of our bodies is really pervious enough to tranſmit the more ſubtile particles of fluids that are applied to them, appears *ad oculum* in the human body, ſince that part of the inteſtines upon which the *veſica bilaria* lies, is always found tinged with bile filtred through the coats of that tenacious membrane.

I know not how elſe the whole ſubſtance of a rigid contracted part comes to be ſoftened and relaxed by emollient ſteams, fomentations, or cataplaſms; or by what other way of communication we can account for the effects of ſome medicines, that, externally applied to the abdomen, prove emetic, cathartic, antemetic, anthelmintic, &c. as well as when taken inwardly, or for the ſucceſs of proper fomentations, &c. applied to the loins in ſome diſeaſes of the kidneys; or of reſolvent applications in diſcuſſing occult tumours of the glands.

Medicines, whether reſolvents or palliatives, of the ſtupifying anodyne kind, may perhaps reach the obſtructed veſſels of the more ſolid parts, by both the propoſed ways. Though, conſidering in what liberal quantities anodynes are uſed externally, and how ſmall a doſe is ſufficient to mitigate pain, or even to cauſe ſleep, when inwardly taken, the abſorbent veſſels may take up as much of theſe as is ſufficient to anſwer for their effects.

V. *REMARKS on the external Uſe of* Tobacco *and* Groundſel, *and on the Effects of Oil of* Turpentine *given internally; by Mr* JOHN STEDMAN, *Surgeon at* Kinroſs.

YOUR propoſals inviting people to communicate any uncommon effects of medicines which they have obſerved, I preſume to lay before you what I have ſeen performed by two very common drugs, that is not generally remarked by the writers on the *materia medica*: To which I ſhall ſubjoin a caution neceſſary in the uſe of another medicine.

Tobacco, beat well with vinegar or brandy into a maſh, and applied in a linen rag on the ſtomach, occaſions ſtrong vomiting, and has ſometimes very good effects in removing hard tumors of the hypochondria. I know two inſtances of its making a complete cure; one is of an old man, who by ſleeping in the open air while the ſerenadas or night-dews fell, was taken in the Weſt-Indies with a numbneſs of his whole body, which ſoon was followed with purging and vomiting; and, theſe going off, he had all the ſymptoms of jaundice, with hardneſs and pain under the ſhort ribs of the left ſide: The pain went off in a few days, but the tumor increaſed. After he had uſed variety of medicines for five years to remove this diſeaſe, a ſea-ſurgeon applied a poultice of tobacco, diſguiſed with green tea, ſugar, and cochineal, upon the epigaſtrium and hypochondria; after this application had been made four or five hours, he vomited a great deal of purulent matter: When the poultice was taken away, the vomiting ceaſed. He continued to apply this maſh once a day for a month, and was perfectly cured. The other example is of a boy fourteen years old, who was cured much in the ſame manner, of a hard indolent tumor of the left hypochonder.

The man had ſix ounces of tobacco in his poultice, the boy had only one; and the quantity muſt always be regulated by the age of the patient.

I had been informed of a young man at Edinburgh, who was famous among the lower ſort of people for curing agues with an external application; and I had ſeveral well vouched ſtories of his ſucceſs: This made me curious to diſcover what his ſecret was. I therefore procured ſome of the poultice which he applied to the pits of the patients ſtomachs; it proved no other than recent erigerum or groundſel beat down into a very coarſe pulp, with ſome other herbs which I believed were put in only to conceal it; for, ſince I came here, I have uſed the groundſel alone with very good ſucceſs. It is applied cold, and cauſes ſtrong vomiting ſome hours after it is applied, which is only done on the days free from the paroxyſm.

Ætherial oil of turpentine is frequently taken in honey, or mixed with ſome liquor, by people labouring under the ſciatic and rheumatic pains; and the patients ſometimes are very careleſs in meaſuring out their doſe, which ought to be ſmall at firſt, and to be very gradually increaſed, for fear of the bad conſequences which happened to the two following women. One, ſixty-one years of age, whoſe doſe I cannot determine, was ſeized with a pain in the kidney and diabetes, and died hydropical in twenty-five days.

The other got two drachms of the oil in warm ale, from a ſmith, which ſoon brought on a ſtrangury, bloody urine, and its total ſuppreſſion, with fever, violent thirſt, and vomiting; ſo that I really deſpaired of being able to recover her; but ſhe was happily cured by the warm bath, and drinking plentifully of Dr Fuller's *emulſio arabica*.

VI. *An Inquiry into the Natural Hiſtory and Medical Uſes of ſeveral mineral* Steel Waters; *by Dr* ALEX. THOMSON, *Phyſician at* Montroſe.

STEEL SPAWS are every where ſo frequent in this part of Scotland where I live, that to imagine them impregnated with iron in ſubſtance, were to conceive the whole country in one mine; for, exceſs and defect computed, there may be reckoned at leaſt one for every pariſh.

The ſoils out of which theſe mineral ſprings riſe are various: That near to Aberbrothock is in the ordinary poorer ſort of the ſoil of this country, the upper ſtratum being a gravelly clay, below which there is another of pebble ſtones intermixed with ſand; under this there is ſand and gravel mixed. The well is in the lower part of a den or hollow ground, having a rivulet running by at the diſtance of about fifty or ſixty paces. The ſide of the rivulet oppoſite to the well is bounded by a gravelly rock, betwixt the layers whereof there ouzes clear water dropping over ſleeks * ſuſpended thereat; and, at the top of the rock, there is a ſmall well of good fountain water. I evaporated the water from theſe ſleeks by the heat of the ſun, and nothing remained but a grey powder, as of ordinary clay. About three or four hundred paces above the well, and on the ſame ſide of the rivulet, there is another ſpring of common water; but there are no more rocks near or above the well for a conſiderable way. The ſoil of moſt other ſpaws which I have examined is much the ſame with that of Aberbrothock, and generally a rivulet runs alſo near them through common flint-ſtone and ſand; particularly, this is the caſe of the well of Kincardine, which is eſteemed in this country next to Aberbrothock: And I am informed by good hands, that the ſoil of the mineral well at Peterhead, at the mouth of the Murray-Frith, is much the ſame, without any rocks in its neighbourhood, except the ſea rocks to which it is ſo near that it is overflowed by high tides.

There are only three ſpaws that I know hereabouts, the ſoil whereof varies from what I have

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* A ſmooth ſhining clay.

have juſt now deſcribed; one of theſe is in Glendy, beyond the famed Kairn, on the top of the Grampions: The ſoil of this well is bog, with moſs-ground round it; and no rock is to be ſeen near it. The ſpring bubbles up between the moſs and the gravel at its bottom, playing, as it iſſues out, like a pot boiling, and appears of the colour of oker, with which one's ſhoes alſo are coloured when he treads on the moſs near the well. I have ſeen another ſituated in a like ſoil in Lentretham, near to the mouth of Glen-iſla: But it does not bubble up as the former does.

The only ſpaw of my acquaintance, that hath any thing of rock uncommon in its neighbourhood, is near to Cortachie, my Lord Airly's ſeat, on the water of South-Eſk: This mineral fountain is ſituated at the foot of a hill near to the river, having, at the diſtance of forty or fifty paces, a good many rocky ſtones, which ſhine or ſparkle like marcaſites when they are broken; and pearls are fiſhed in the neighbouring river. I have ſent ſome of theſe ſtones for your examination; but they are not ſo bright or ſhining and of ſuch a poliſhed ſurface, as others which I have ſeen on the other ſide of that ridge of the Grampions in Gleniſla.

After conſidering the ſoils from which theſe ſteel ſpaws riſe, and all in their neighbourhood, I would think that the moſt probable account which can be made of their mineral origins may be taken from the diſcoveries of Mr Geoffroy, and of Mr Lemery the Son, compared *. Geoffroy, after attempting to make iron with the clay of brick and lintſeed-oil, found, by ſome ſuch experiments, that there was iron in all vegetables which he could put under trial; for all of them had particles which the loadſtone, or needle touched with it, attracted. And Mr Lemery, by expoſing vegetables to the burning-glaſs, fuſed them into a metallic maſs in the ſame manner as was done to filings of iron; and from hence takes occaſion ingeniouſly to account for this mineral's aſcending, its gravity notwithſtanding, through the whole compages of vegetables: Which he illuſtrated and confirmed ſtill further, by his experiment on iron diſſolved, firſt by ſpirit of nitre, and then by oil of Tartar, when it arbored all over the ſurface of the veſſel in a great variety of branches. What I aim at may ſtill be more eaſily conceived from what Le Givre, a man of good ſenſe and learning of his time, writes concerning the medical wells of Provence, to wit, That, in trenches digged for diſcovering the origins of theſe wells, and, on the ſides of the neighbouring ditches, he found the mineral fluid drilling through its ſmall conduits, and becoming of the conſiſtence of the dreg of oil: And then he tells us the various colours it aſſumes in analogy to crocus martis, and deſcribes its different degrees of conſiſtence and ſolidity, according to its being more or leſs expoſed to the air. It is probable that the like diſcoveries in ſeveral other parts of France induced Lemery

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[*] Memoires de l'Acad. des Sciences, 1704, 1705, 1706.

Lemery to ſay, that France abounds in iron every where; for, I believe, we have not otherwiſe heard of mines of iron being every where in that country. So that our medical wells may bear a juſt analogy to their mineral progeny of vegetables, if ſuch new phraſe of language may be allowed; and I think the volatility of our ſpaws, diſcovered, both by the experiments made with them, and by their medical effects, of which hereafter, may hence be beſt accounted for. Nor needs what I have here argued for be thought ſurpriſing, ſince the beſt philoſophy hath proved the primogenial earth, compared with it as at preſent, to have been of a more liquid conſiſtence. And Mr Boyle and Monſ. Tournefort have diſcovered the ſame of gems, marbles, and corals.

Whatever truth is in this doctrine, Mr Geoffroy and Lemery's experiments lead us to underſtand why ſteel ſpaws are ſo frequent; and really conſidering how much the mineral is diffuſed over all, one would think that all waters ſhould be impregnated with it; and poſſibly they may be ſo, only the proportion of the mineral is ſo ſmall in moſt fountains, that the common trials will not diſcover it.

I could find no difference in the ſpecific gravity of the ſteel waters I tried, from that of common fountain water.

The fixed mineral contents of the ſteel waters of Aberbrothock and Peterhead may be collected much more eaſily than is done in the common method of evaporating the whole water, if the mineral water is put in open bottles ſome days; for then its contents precipitate, and the water being poured off, will let fall any remains of the mineral, by affuſing common fountain water: And the precipitations may be haſtened, by mixing any proper adſtringent. The mineral ſubſtances thus collected, are afterwards to be dried in the ſhade, ſun, or analogous heat of fire. In this manner they will be got more entire, than when ſuch a ſtrong heat is employed as is neceſſary in boiling, which may force off the moſt volatile ſubſtances.

After four Scottiſh pints of Aberbrothock water were evaporated leiſurely at the well, there was no appearance of a pellicule, and the dried powder that remained weighed, as near as an accident of loſing a little of it would allow me to judge, between fifteen and twenty grains; this I threw into a hot iron laddle, when it ſparkled into little flammules, juſt as the fine filings of iron uſe to do: But the powder of the fleeks of the well ſparkled but faintly when ſo tried.

Monſ. du Clo's experiments ſatisfy me, as they did him, that it is not eaſy to determine what ſalts theſe waters contain, or whether all are impregnated with the ſame kinds of ſalts: He could find neither allum nor vitriol in any of the French wells; only in one he found ſome reſemblance of the latter: All the other wells gave a ſalt, anſwering to a compoſition of nitre and ſea ſalt mixed in various proportions; which probably is the natural ſalt of the earth diſcovered by Mr Tournefort* reſembling in moſt trials the natrum of the

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* Preface to his hiſtory of plants in the neighbourhood of Paris.

Levant, being neither acid nor alcali, but approaching moſt to the latter.

The gall, myrobalan and granat bark were chiefly uſed by Du Clos, to diſcover the ſteel ſpaws of France, and to determine the greater or leſſer degrees of the mineral contents, by the higher or lower tincture which they made, when mixed with the mineral ſteel waters: Which trials have alſo anſwered very well with me, only, ſeeing the myrobalans give a reddiſh tincture to ordinary water, and, obſerving the mineral waters going upon the ſame colour when I uſed them, I have choſe to make my trials with the gall, and employed either the ſhell entire, or its tincture, becauſe the powder or its infuſion generally makes the water muddy. Having therefore affuſed the ſame quantity of Peterhead and Aberbrothock waters on like quantities of gall, the Peterhead water ſtruck a deep purple colour, and the Aberbrothock water became only dilutely red, as a *vin paillè;* then I added by degrees double the quantity of common fountain water to the Peterhead water tinctured with the gall, before it became preciſely like to the colour of the Aberbrothock water with the gall in it: Whereby we may ſee that the mineral, as reached by the gall, is two thirds ſtronger in the Peterhead than in the Aberbrothock water. The water of Glendy came neareſt to the Peterhead well in its deep tincture; next to this was the water of Kincardine: Moſt of the other ſpaws that I have examined give a tincture much like that of Aberbrothock; ſome, a little higher; others, ſomewhat lower.

The infuſion of the ſleeks gathered from the ſtones wherewith the well of Aberbrothock is encompaſſed on the ſides, and covered above, made with water or vinegar, ſtruck a ſtrong coloured tincture when galls were mixed with it.

Rectified ſpirit of wine makes no change on the ſteel waters; but, when the gall is afterwards added, the tincture is higher than when no ſpirit is uſed. The common ſpirit of wine mixed with the mineral water, turns it of a fine light violet colour; and, when the gall is added, the tincture becomes more duſky than by the gall alone: Whether is it not probable, that the rectified ſpirit exalts in ſulphur, or other active principles partaking of the nature of ſulphur, without making any tincture, but only augmenting that given by the gall? Whereas the common ſpirit gives a tincture, which, being confounded with that of the gall, forms that duſky colour.

Our ſteel ſpaws which I have tried, appear to be ſo very volatile, that, by the leaſt acceſs of air after they are taken up from the well, all that bears trial in them goes off, eſpecially if they are taken up in a hot ſun; you will better comprehend this, when I tell you, that lately I cauſed two bottles of Aberbrothock water to be taken up in my ſight, and to be immediately well corked and roſined: Next day, the firſt of them I put under trial anſwered ſcarce more than ordinary fountain water; but the other anſwered in the ordinary manner. The only reaſon I could find for this was, the cracking of the roſin, and roughneſs of the neck of the bottle, which hindered the cork to apply ſo cloſe to the bottle in which the firſt water was contained: This taught me to believe I had not been formerly abuſed, as I ſuſpected, when I found this and ſome other waters brought me to have a ſenſibly vapid taſte, and to contain nothing of the mineral; though I muſt tell you, that, when I formerly had Aberbrothock water under examination, and did not uſe ſo much precaution as lately, I did not meet with ſuch diſappointments; which I can attribute to nothing but the difference of the ſeaſons, the water being taken up for my late trials in very hot weather.

As I found the Liege and Piermont ſpaws giving the ſame tincture with galls, and agreeing every other way, the vinous flavour peculiar to theſe foreign waters only diſtinguiſhing them, ſo I have ſeen theſe alſo faint of taſte, and refuſing the uſual trials, on occaſion of being ill corked or roſined.

I come now to conſider the medical uſes of theſe ſprings. As they evacuate moſtly by urine, but rarely by ſtool, and only in the more lax and flabby texture of the bowels, I have found them, eſpecially that of Aberbrothock, good in nephritic diſeaſes, ſcouring off gravel, and ſometimes puſhing a ſtone down. They are beneficial in ſcorbutic foulneſſes, eſpecially when the humours are in an aceſcent diſpoſition; in all diſeaſes of the ſtomach depending on an acid; and, in general, they are ſerviceable, and may be uſed more freely in all indiſpoſitions, occaſioned by what phyſicians call a morbid acid in the body; but, where the alcaline or bilious diſpoſition prevails, they are to be more ſparingly, if at all, taken. And as obſervation hath evicted the diſtinction of ſuch oppoſite cauſes of diſeaſes, ſo the trial by galls, their turning ſyrup of violets, tincture of roſes, &c. green, diſcover the alcali in them; which might have undeceived men from being ſo fond of denominating them ſo generally *acidulæ*.

My experience in the cure of diſeaſes by theſe waters, will not allow me to ſtate univerſally their comparative virtues on the higher or lower degree of tincture from the mixture of other ſubſtances with them; for I cannot ſay whether the deeper colour of Peterhead water with galls, depends on a greater quantity of the ſame mineral ſulphur, or on a firmer combination with its earth; or whether they may not contain a groſſer ſulphur, or a larger proportion of earth than is in Aberbrothock waters. All I can hitherto determine by obſervation is, That, in flaccidneſs, and too great relaxation of the ſolids, eſpecially of the ſtomach, and other chylopoietic organs, the Peterhead water has by far the pre-eminence: As, on the other hand, I have found the uſe of the Aberbrothock water of ſingular advantage, in lowneſs of ſpirits and other maladies, where the nerves are ſaid to be affected; for which I have alſo ſeen the Kincardine water beneficial.

One of our burghers, about thirty years of age, of a clean and healthy conſtitution, having met with ſtormy weather at ſea, fed on ſalt meat, and having bad ſucceſs otherwiſe in a voyage, returned ſcorbutic, emaciated, enervated in all the digeſtive powers, low ſpirited, and ſo extremely feeble, that he could walk or ſit on horſeback with difficulty: After drinking Aberbrothock water at the fountain a few days, he walked about with eaſe, and with much more vigour.

A gentleman of honour, aged ſixty, of a vigorous body, and who had enjoyed good health, impaired at times by good fellowſhip, from an inability to walk without ſupport, recovered ability to walk with eaſe by the ſame means in a few days: And he received the ſame benefit in a greater or leſſer degree for ſeveral years, in which he uſed that mineral water.

A lady in a declining age, having had uneaſineſs in her mind, and becoming otherwiſe of infirm health, every accidental diſorder was accompanied with a notable ſinking of ſpirits. After various medicines that ſeemed at times to gain on the diſtemper, which always however returned rather worſe; and, the lowneſs of ſpirits ſtill attacking her leſs or more, ſhe drank the Aberbrothock water at her own houſe in the ſpring: The water was always taken up at night, and kept freſh two or three days, and then was renewed. She continued the uſe of it a month, with ſome little intervals, and thereby recovered both health and ſpirits.

A gentleman having ſuffered an aguiſh indiſpoſition ſeveral years, it ſhifted at laſt into low ſpirits to a great degree; which he recovered in a good meaſure, by taking to a low diet. When his ſymptoms return, as they often do, the Liege and Piermont ſpaws and Aberbrothock water in its ſeaſon are of good uſe to him; frequently he prefers the laſt to the others, though it is brought farther and longer kept than in the former caſe.

I have mentioned theſe two caſes to ſhew, that notwithſtanding the virtue of the water is ſo liable to fly off, yet it proves of good effect at a diſtance from the fountain; and it may prove better this way, if taken up at a right time, than when it is drank at the well in a hot ſeaſon, after the ſpring hath been expoſed ſeveral hours to the morning ſun.

The beſt ſeaſon of drinking theſe waters is doubtleſs in April and May, after the ſpring rains have fallen, and before the heat of Summer comes on; and in the month of Auguſt, to the middle of September, before the Autumn rains begin; at both which ſeaſons they generally taſte moſt of the mineral: And it is commonly obſerved, that, in the hotteſt weather, theſe waters taſte moſt faint, except after a moderate ſhower of rain, when the taſte turns ſtronger, but it is weakened after great rains. The badneſs of the quarters, and the pleaſure and convenience of walking about in open air, have however determined the ſeaſon of uſe to the two intermediate Summer months: But I enjoin the people who aſk my advice to drink this water rather at home in the proper ſeaſon, and to put the cold air off it at a fire, if it proves cold to the ſtomach.

Great numbers drink the waters of Aberbrothock, without obſerving any regimen, or having any directions from a phyſician; nor do I enjoin any conſiderable preparation of body to my patients, except in very remarkable foulneſs of the juices. Nor do I allow them to take phyſic for purging, during the uſe of the water, if they are not to bath in them. The medicine I ordinarily give is cryſtals of tartar, to promote the evacuation in the moſt ordinary natural way. With this I ſometimes give ſtewed prunes, or ſuch like, to ſtir a ſluggiſh belly a little.

The vulgar opinion of all the benefit of this water being proportioned to the quantity drunk, prevails ſo much here, without any regard to the conſtitution, and ſtrength of the patient, or nature of the diſeaſe; and ſo many remarkable accidents have happened by drinking too much, that there is juſt reaſon to doubt, whether the abuſe of theſe waters does not more harm than the right uſe does good. My general rule is not to exceed three Engliſh pints drunk leiſurely, eſpecially till the evacuation by urine begins, chewing cinnamon, carvie, or any other eaſy aromatic as the ſtomach requires during the drinking, and walking in the intervals of their drinking and after they have finiſhed their day's doſe, till they begin to be ſenſible of fatigue.

This rule concerning the quantity to be drunk, and exerciſe while drinking, I have found to require one caution, and one exception. The caution is taken from the indications in view. When the ſprings of the fibrous ſyſtem are to be ſcrewed up by the force of the mineral, its greateſt quantity and ſtronger conſiſtence with leſs of the diluent element are neceſſary; and therefore the waters which give the higheſt tincture upon trial, and theſe drunk in ſmaller quantities are preferable: And this makes me regret that there are no tolerable quarters nor fields for walking near the Glendy well, which is of the higheſt mineral tincture next to that of Peterhead. I have cauſed it to be brought ſometimes to peoples houſes, where it did good; but I have never ſeen the uſe of it long enough protracted to make any obſervation of conſequence thereon. If our deſign principally is to waſh the inwards, the weaker kinds of the mineral waters are moſt proper.

The exception to exerciſe is chiefly in the caſe of great relaxation of the ſtomach and digeſtive powers, which makes the patients liable to throw up their food, as moſt frequently happens to females. I order ſuch to feed a bed, and to lie cloſe till the firſt digeſtion is accompliſhed; and this ſerves to good purpoſe preventing the ſtomach's caſting up its contents. A Gentlewoman ſuppoſed quite loſt in this diſeaſe, her inward powers being altogether enervated with a miſerable ſcene of ſucceeding ſymptoms during ſeveral years, was at laſt carried from this place to Peterhead, where ſhe drank all the water a bed, laying herſelf to ſleep after each draught; by which means ſhe retained all: And, tho' ſhe got into drinking the water to the exceſs of a Scottiſh pint a day, yet ſhe returned perfectly recovered, and remains ſo theſe ſeveral years.

The Aberbrothock water has got the preference to the reſt in this country, moſt cures having been made by it. Whether this is owing to its vogue, having occaſioned a greater number of patients to repair to it; or whether it depends on its intrinſic comparative virtue from the ſulphur, which I begin to diſcover more conſpicuous in it than in the others, I ſhall not determine; but, in all ordinary caſes, I recommend the neareſt ſpaw, and have frequently ſeen the effect anſwer, eſpecially by Kincardine well and that on our river of Eſk, in the ſkirts of the Grampions; the former however comes nearer to Aberbrothock water in the cure of nervous diſeaſes. A girl in bad caſe of the nerves, as nature was framing her into the condition of her ſex; and her brother, a boy of ten years of age, enervated to almoſt a cripple all over his body, are now recovered by drinking and bathing in theſe waters two ſeaſons.

VII. *An ESSAY concerning the Analyſis of human Blood; by Dr* GEORGE MARTINE, *Phyſician at* St Andrew's.

I. *The blood a heterogeneous Maſs.*

THOUGH the blood, upon its firſt eruption out of the veſſels of animals, ſeems to be an uniform red liquor, every body acknowledges it to be a very heterogeneous fluid, and compoſed of particles very much differing from one another. We are all ready to ſuſpect a diſſimilarity of parts in that maſs, which is made up of ſuch a multitude of different ingredients, and which furniſhes ſuch a variety of appearances, and new productions in the animal body. In like manner, from the various effects of different mdicines, and from ſome particles diſplaying themſelves in a morbid ſtate more ſenſibly than others, Hippocrates [*] inferred their prior exiſtence in the blood; though naturally, and in a ſound ſtate, from their exact mixture and balance, they do not diſcover themſelves by any ſenſible effects.

II. *Its Compoſition, according to the Antients.*

2. The moſt obvious compoſition of the blood is of a thin watery liquor, and a thick reddiſh lump, into which we find it ſo ready to ſeparate [†] upon its emiſſion out of the body, throwing off at the ſame time a volatile ſmelling ſteam [‡]. The red part the antients looked on as the αιμα the true proper blood; and the other the *phlegma*, as its diluting ſerum, or whey, or white blood [‖]. The redneſs of the muſcles, and other ſanguineous parts, they juſtly reckoned the effects of a greater quantity of theſe red particles, which conſtituted, according to them, the firſt and chief element of the whole maſs. And as they ſaw [**] watery liquors ſeparated from the kidneys and ſkin in great

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[*] De vet. med xxiv. De nat. hum. v. vi. viii.

[†] Galen. de elem. 1. 2. de melanch. 11. Avicen. lib. 1. Fen. 1 doct. iv cap. 1. p. 23.

[‡] Helmont. oper. pag. 577. Cartes epiſt. 1. 80. pag. 277. Cornel. progymn. phyſ. vii. pag. 290. Malpigh. de polyp. cord. pag. 130. Bellin. opuſc. ad Pitcarn. xxxix. pag. 192. Boerhaave inſtitut. med. § 167.

[‖] Hippocr. de gland. 1. 6.

[**] Vid Galen. com. in. iii. epidem. 1. 5.

quantities, and other lymphatic liquors in other parts of the body, they thought theſe to be the immediate product of the ſerum of the blood; and ſo the *phlegma* came to be the ſecond element. And, obſerving this commonly to be of a yellowiſh colour, and likewiſe finding a conſiderable quantity of bile of that hue to be ſecerned from the blood, they ſtraightway concluded it to be the immediate product of theſe yellow particles tinging the ſerum, and another element of the ſanguineous maſs. This too they thought frequently to be ſecerned by medicines, which therefore they called *cholagogues*, or purges of bile. And laſtly, becauſe the under part of the craſſamentum is generally of a very dark colour, they reckoned it to be of the ſame nature with the blood or liquor of the ſpleen, and the blackiſh liquors thrown out of the body by vomit or ſtool. And ſuch, from a particular prepoſſeſſion, were they pleaſed to call the *melancholia*, or black bile, which they reckoned as the fourth element of the blood. And this compoſition of the blood, as made up of theſe four elements, was moſt carefully cultivated, and the theory and practice of medicine adapted thereto in all times, from before the days of Hippocrates, till the laſt age, that it began to give way to principles of another kind. The chemiſts ſet up a laboratory in our animal ſyſtem; and the philoſophers and mathematicians introduced their diagrams into the human body.

3. We cannot deny, that from the blood are produced phlegm, bile, and what the antients called melancholy; and conſequently that all

theſe exiſt, at leaſt virtually in the blood: And ſo may we ſay of the ſaliva, pancreatic liquor, common lymph, oil, mucus, lacrymæ, ſemen, arteries, veins, nerves, bones, &c. But we are not ſtraightway to infer, that all theſe did formerly exiſt in the ſame form, as elements or principles thereof. What a great ſhare of their preſent form and appearance do theſe various liquors and particles owe to the action of the organs, to which they belong, and to the various combinations and circumſtances they undergo?

III. *The chemical Analyſis of the Blood.*

4. Some of the firſt philoſophers * repreſented the human blood as the product of air, ſome as of fire, ſome as of water, and others as of earth. There were not wanting ſome † who thought it was an aggregate of ſuch natures blended together. But the chemiſts pretended to put the compoſition of the blood beyond diſpute: By diſtillation they reſolved it into water, ſulphur, ſalt, and earth; and theſe they affirmed to be the true principles of which it is compounded.

5. But, when we conſider the matter fairly, all we can juſtly conclude from their experiment is, That the blood, upon ſuch a heat being applied to it, and in ſuch and ſuch circumſtances, is capable to exhibite ſuch and ſuch ſubſtances

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* Vid. Hippocr. de nat. hum. f.

† Vid. Galen. de decr. Hippocr. &c. viii. 7.

ſtances of various forms and natures, though theſe, as they appear in the common chemical analyſis, never did nor never could exiſt in a living animal. Indeed there is plainly a great deal of water in our blood. There is likewiſe ſulphur too, or the inflammable principle. The great quantity of oil, wherewith all our aliments abound, furniſh it ſufficiently. And the fat exiſting in all animals, ſhew plenty of it in the blood, from which it is ſecerned: Nay, in ſome circumſtances we can diſcover the oily particles circulating in the maſs of blood[*]. Innumerable conſiderations, even the taſte itſelf, convinces us of ſalt in the blood; and there is no room to doubt of earthy particles likewiſe exiſting therein. And, beyond what the ordinary chemiſts took ſufficient notice of, the air-pump[†], as well as the fire, [‡], and other operations[§], ſhew there is air in the blood; that is to ſay, particles which, when by themſelves, and ſeparated from the reſt, conſtitute a heavy elaſtic fluid, readily mixing with, and not eaſily diſtinguiſhable from common air. But all theſe elements, as they are called, can neither exiſt in the blood, nor make up its compoſition in the common ſenſe the chemiſts were wont to underſtand them. The aerial particles never exert their elaſtic force in a heal-

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[*] Malpigh. de oment p. 42. Vit. poſthum. p. 92. confer & Ruiſch. Theſ anat. i. rep. 1. 3. p. 14.

[†] Boyle in phil. tranſ lxiii. abr. ii. p. 228. &c. Phyſico. mech. exp, abr ii. p. 540 541 634.

[‡] Hales veg. ſtat. exp xlix. p. 173.

[§] Papin. in phil. tranſ. abr. ii. 247. Boyle Phyſico. mech. exp. abr. ii. 581. 641. — 649. Hales veg. ſtat. exp. lxxx. p 202, Boerhaave chem ii. proc. cxv. p. 351.

thy ſtate * and the fœtid, volatile, and fixed oils, and the alcaline ſalt, are entirely the effects of a proceſs that can never exiſt in the animal body †, and of a degree of heat no living creature is able to bear ‡.

IV. *The* Carteſian *Hypotheſis of the Particles of the Blood*, &c.

6. What an odd work did Mr Des Cartes, and his mathematical diſciples, make in the animal machine? The particles of his ſeveral elements ſerved them upon all occaſions; and you would think they had really ſeen the different ſpheres, cubes, priſms, pyramids, parallelopipeds, &c. circulating in the maſs of blood; and wiſely adapting themſelves to all the purpoſes they were pleaſed to appoint them; and paſſing through various channels and orifices of a round, ſquare, oval, triangular, quadrangular, oblong, or any other figure you could fancy.

7. But they might have learned from Fabr. ab Aquapendente § and Dr Cliſſon ‖, how readily all the veſſels of an animal would affect a round figure; the neceſſity of which was fully made out by Dr Pitcairn **. And as to the circulating fluids, about which is our

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* Boerhaave chem. p 525.

† Helmont. oper. p 91. 6. 7 327. 35. Boerhaave chem. ii. proceſſ 119.

‡ Boerhaave ibid.

§ De form. fœt. ii. 2 p. 81.

‖ De ventric. &c. xxiii. 21.

** Diſſert. de circ. ſang. per vaſa, &c. § 15.

main buſineſs at preſent, taking things in a geometrical light, upon a nearer view, and the ſtricteſt ſcrutiny, we can perceive no ſuch variouſly figured corpuſcles in the blood of animals. All we can diſcern, when aſſiſted with the beſt microſcopes; are ſpherical particles ſwimming in a pellucid liquor. This Malpighi [*] and Leuwenhoek [†] diſcovered; and their obſervations are eaſily verified by ocular inſpection. And this leads us to a juſter and more intelligible analyſis of the blood.

V. *The Blood made up of Globules of different Orders or Magnitudes.*

8. By numberleſs obſervations, Leuwenhoek has ſhewn the largeſt and moſt viſible particles of the blood to be thoſe globules which tinge it of a red colour; and which therefore do chiefly make up what we call the craſſamentum of extravaſated cruor. They are of a certain determined magnitude [‡], the ſame in different parts of the ſame animal, and even in different animals however differing in bulk; of the ſame ſize in an ox, as in a ſheep, or a rabbit [§]. And theſe plano-oval particles in the blood of fowls and fiſhes, which reſemble thoſe globules of terreſtrial animals, are the ſame in the greateſt whales, as in an eel or a frog; the ſame in an eagle, as in a ſparrow. Thoſe

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[*] Vit. poſth. p. 92. de polyp. cord. p. 130.

[†] Phil. tranſ. cii. p. 23.

[‡] Arcan nat. det. epiſt. lx. p. 78. Tabor. exerc. med. iii. § 2. p. 58.

[§] Leuwenhoek ibid & epiſt. cxxviii. p. 220.

greateſt ſpherules we chuſe to call the great red globules of the blood, or the globules of the firſt order.

9. Theſe are eaſily perceived by any body; but the ſharp-ſighted Leuwenhoek went further, and diſcovered the compoſition of theſe globules, which he found * made up of ſix ſmaller ſpheres cluſtered together in a very regular way; and that ſo nicely, that, in a perfect globule, the compoſition comes to be imperceptible: But ſometimes he ſaw a red globule looſening and breaking into theſe compounding ſpherules; and ſometimes he had the good fortune to perceive theſe running together, and beginning the compoſition of a new red globule. Theſe ſmaller ſpherules we call globules of the ſecond order.

10. This curious and accurate obſerver of the *minima naturæ* did not ſtop here; he ſaw † in the chyle and blood a great many particles ſix times leſs than theſe globules of the ſecond order, and thirty ſix times leſs than the great red globules. The globules of the ſecond order are then to be looked on as compounded of theſe ſmaller particles, which therefore are juſtly to be reckoned as another claſs, or globules of a third order.

11. But, moreover, tho' the ſmaller globules are perfectly tranſparent, and conſequently not diſtinguiſhable one from another, we are certain from the ſame Mr Leuwenhoek's obſervations,

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* Ibid. epiſt. lvi. p. 8. Epiſt. lvii. p. 36. Epiſt. cxxviii. p. 221. 222. Anat. &. contempl contin. p. 119. 120, 121.

† Arcan. nat. det. epiſt. lvi. p. 12. Anat. & contempl. § 1. p. 30. 34. 35. Contin. p. 119.

that there are innumerable veſſels of ſuch a ſmallneſs, that none of theſe hitherto mentioned globules could paſs: So that it is neceſſary to ſuppoſe inferior claſſes of globules of the fourth, fifth, ſixth, &c. orders. Whence, by analogy, we are to conceive globules of the third order, made up of ſix globules of the fourth; and theſe again made up of ſix of the fifth order; and ſo on through ſeveral degrees, the number whereof we are not to take upon us to determine. Leuwenhoek * ſaw veſſels, the wideneſs of which was leſs than the eighth part of the diameter of a red globule; ſo that the particles paſſing through them ſhould be upwards of five hundred times leſs than ſuch globules, and conſequently ſmaller than thoſe of the fourth order. Yea, upon a careful examination †, he could perceive ſtill ſmaller veſſels, narrower than the tenth part of the diameter of a red globule, and conſequently not capable of tranſmitting ſpherules greater than if a red globule were broken down into a thouſand parts. Theſe ſhould almoſt coincide with globules of the fifth order; and that, as near as we can expect, obſervations of ſuch minute things to carry us.

12. What a beautiful harmony and regularity do we here perceive in the conſtruction of the maſs of blood!

Magnum certe opus oculis video.

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* Anat. & contempl. § 1. p. 31.

† Ibid. p. 32.

The globules of the firſt order are made up of ſix globules of the ſecond, theſe of ſix of the third, theſe of ſix of the fourth, theſe of ſix of the fifth order, and ſo on. And accordingly we find the globules of the higher orders may be broken down into their compounding particles. In ſome caſes, that the blood may be turned into ſerum, *αιμα διωρρωθὲν*, was obſerved by Ariſtotle *. Nor did ſuch a change of the blood (*in ſerum ſanguis tandem fere totus degenerat.*) eſcape the obſervation of the accurate Dr Harvey †. But the judicious and moſt careful Boerhaave ‡ has moſt diſtinctly of all obſerved how very apt the globules of the higher orders are to loſe their contexture, and to be broken down into the ſmaller compounding particles, when they are left to themſelves, and without the aſſiſtance of the circulation.

13. It ſeems to be very well worth obſerving, That juſt ſix ſmaller ſpherules ſhould make up a larger globe, if you were to chuſe the moſt convenient and firmeſt way of conſtructing it. Were there but 2, 3. 4, or five compounding globules, then, in the running together of theſe, the new compounded particle would be too angular, and its parts eaſily disjoined. On the other hand, were there 7, 8, 9, or 10, &c. too many of them would be out of contact from the reſt, and conſequently for that reaſon, not adhering ſo firmly neither; and ſo their coheſion likewiſe eaſily diſſolved.

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* Hiſt. animal. iii. 19.

† De gen. animal li. p 160.

‡ Aphor. § 94 95. chem. ii proc. 227.

But, in a regular coaleſcence of ſix, every ſpherule is in contact with other four, juſt in four equidiſtant points; ſo that they are very firmly joined, and not very ſubject to a diſſolution from external injuries. In Fig. 1. and 2. of Tab. I. we have the ſix ſmaller ſpherules, but juſt touching one another, before they run together. In Fig. 1. we have a view of five of them, A. B, C, D, E, the ſixth F, being out of ſight: But, turning them a little, as in Fig. 2. we ſee diſtinctly all the ſix compounding ſpherules, three of them lying before, and as many behind. In Fig. 3. and 4. we ſee the ſame ſpherules adjuſted to one another, and compacted together into one greater globe; wherein I have expreſſed the lines of contact, by which we conceive they are run together, and where they would looſen if they were to be diſſolved and broke aſunder. It ſeemed the more neceſſary to give this delineation that Leuwenhoek's own figures * are not very regular, nor apt to give a juſt enough idea of the coaleſcence of the compounding particles, or of the true conſtruction of the compounded globule.

14. From this conſtruction of the blood, we ſee no room left for Bohn's † idea of the red globules, as made up of the viſcid bullulæ incloſing little ſpherules of air, which Bernouilli ‡, Keil §, and ſome others of our mathematical phy-

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* Arcan. nat. det. epiſt. lv. p. 2. Epiſt. cxxviii. p. 221. 221.

† Circ. anat. xiii p. 199

‡ Diſſert. de mot. muſc. § 5.

§ Tentam. V, p. 135.

phyſiologiſts [*] thought ſo much for their purpoſe. And when, from microſcopical obſervations [†], they found a globule, upon its arrival at a ſmall veſſel it was not able eaſily to go through, to be compreſſed and flattened in its paſſage; and immediately, when got into a wider channel, to reſume its former round figure, they forthwith concluded that appearance to proceed from an incloſed elaſtic fluid, reſtoring itſelf after compreſſion. How much more ſimple, yea obvious, would it have been to have had recourſe to that common property of all fluids, whoſe particles, when touching one another, affect to form themſelves into a ſpherical figure. This is the appetite of continuation, or union of my Lord Verulam, the congruity of Hook, the *niſus in contactum*, and the *vis cohæſionis*, and *contractio naturalis* of Bellini, which Sir Iſaac Newton choſe to call by the old words, attraction and gravitation; which theſe great and inquiſitive philoſophers, following the wiſeſt of the antients, found to be inherent in all bodies we have occaſion to make our obſervations upon, and to be the immediate cauſe of many of the principal phænomena of nature.

15. Not only the compounding particles of each globule are endued with this property, but likewiſe the globules themſelves have a very

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[*] Mead of poiſons 1. p. 15. Cheyne's phil. princ. of relig. Vol. 1. p. 309. Wainewright of the non-natur. vi. 16. p. 64.

[†] Vid. Leuwenhoek Arcan. nat. det. epiſt. lxv. p. 161. in phil. tranſ. cxvii. p. 380. Cowper in phil. tranſ. cclxxx. abr. v. 1. p. 331.

ſtrong mutual attraction or *niſus in contactum et cohæſionem*. When extravaſated blood is left to itſelf, we ſoon perceive how forcibly the red globules run together and coaleſce, and ſqueeze out the interveening ſerum in ſome animals with a greater, in others with a ſmaller force. This force in the blood of deers is ſo weak, as that it ſcarcely coagulates into a firm craſſamentum [*]. On the contrary, in ſome great and ſtrong beaſts, it becomes a tough and almoſt indiſſoluble maſs: So that the blood of bulls was frequently drunk by the antients as a moſt effectual poiſon [†]. Nay, even the pellucid watery ſerum, which conſiſts of globules of inferior orders and magnitudes, is very ready to loſe its fluidity: In a certain degree of heat, before much of it is exhaled, it becomes a firm and ſolid ſubſtance [‡].

16. It will perhaps be aſked what we have done with the fibres, which many, and theſe great men too, have deſcribed as very eſſential parts of the blood of animals. But if we deal candidly, tho' even Malpighi [§] did ſtrenuouſly ſtand up in their defence, I am afraid we muſt yield to the ſuperior force of

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[*] Ariſtot. hiſt. animal: iii. 19. De part. animal. ii. 4. Meteorolog. iv. 7. Plin. hiſt. nat. xi. 38.

[†] Herodot. hiſt. iii. 15. Plin. hiſt. nat. xi. 38. xx. 9. xxiii 7. Plutarch. in vita Themiſtocl.

[‡] Gelzadius apud Barbat. diſſ. de ſang. &c. p. 10. Boyle of Fluids, &c. abr. i p. 329. Uſeful. of exper. philoſ. abr. i. p. 32. Lyſer in Barthol. epiſt. med. 11. 33. p. 503. Malpigh. epiſt. 1. de pulm. p. 131. Tabor. exerc. med. p 66.

[§] De polyp. cord. p. 125. Vit. poſthum. p. 45.

Borelli's *, and Bohn's † arguments, and confeſs that we can find no veſtiges of them in the blood in a natural ſtate. If they were in the veſſels of animals, they could not but diſturb the circulation. And their exiſtence ſeems to be entirely owing to a ſubſequent preparation of extravaſated blood, whoſe viſcid parts, by the heat of warm water, and conquaſſation, or ſome other ſimilar artifice, run together in ſuch new forms.

VI. *Of the Temperaments denominated from the conſtituent Parts of the Blood.*

17. All animals (I mean ſuch as we are chiefly concerned with) have globules of all the ſeveral orders, ſcattered thro' their blood; but in no certain or fixed proportion: Which may likewiſe be affirmed of the conſtituent parts of the blood, when they are conſidered as giving riſe to the compounding humours of the antients, and to the chemical elements. From the conſideration of which variety it will be of uſe to take a view of the various temperaments of the human body, ſo much talked of, and ſo little underſtood, that we may the better underſtand the ſyſtems of the antients, and alſo have ſome idea of a middle conſtitution, to which all the calculations relating to the properties of the blood are to be referred.

18. If the blood be plentiful, and abound with red globules, or thoſe of the firſt order, ſuch a

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* De mot. animal. ii. prop. 132 p. 198.

† Circ. anat. xiii. p. 187.

ſtate will plainly enough conſtitute what the antients called *temperamentum ſanguineum*; the ſymptoms whereof are eaſily explained from theſe circumſtances.

19. When the red globules were ſcarce in the blood, and it was found thin and watery, this was called a phlegmatic temperament.

20. If the blood happened by any means to acquire a great many thick, tough, and leſs moveable particles, theſe the antients looked on as the chief ingredients in the *atra bilis*; and ſuch a conſtitution was with them the *temperamentum melancholicum*, which the learned Boerhaave * thinks may be better explained from chemy; and that, in ſuch a ſtate, it is chiefly the earthy, and ſome of the more viſcid oily particles that abound.

21. Our aliments are generally of an aceſcent kind, or the product of ſuch; but, by the action of our bodies on them, they are ſoon reduced to a neutral ſtate. Yea, ſuch is the frame of animals, that the force of the circulation bringing the particles of the blood always farther and farther from their former acidity, animalizes them (if I may uſe the word) more and more, renders them volatile, and perſpirable †; and at length, if there be no new ſupplies or obſtacles to hinder it, even diſpoſes them to an alcaleſcent ſtate ‡; the breath

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* Inſt. med. § 228. Aphor. § 1092. 1095. Vid. &c. Pechlin de purg. p. 45.

† Helmont. p. 91. 4. p 148. 31. p. 149. 34. p. 150. 39. d. 151. 45. p. 177. 60.

‡ Vid Boerh. aphor. § 80. 109. Chem. ii proc. 88. p. 293. proc 95. p. 313. proc. 100. p. 323.

ſtinks *, and the blood turns putrid †. Now the bile is found ‡ to have undergone a long courſe and circulation, before it is ſecerned from the reſt of the blood, and to be one of the moſt perfect animal liquors, and the furtheſt removed from any aceſcent quality; and in plenty and perfection in thoſe who have a ſtrong circulation, and all their vital operations carried on with vigour §. And it is ſuch a conſtitution going to too great a height, that will truly make what the antients called a choleric or bilious hot temperament.

22. The direct contrary of which, importing an irregular and weak circulation, and not ſufficient to overcome, and alter the diſpoſition of our aliments, ſeems to coincide in a great meaſure with the cachexia of the antients ‖; which might be looked on as a ſort of temperament, and a deviation from the natural and regular conſtitution; and not ſo properly to be a particular diſeaſe, as a ſtate of the body giving riſe to a great many diſeaſes eaſily flowing from ſuch a ſtate. And this frequently falls in with the phlegmatic temperament; as, on the other hand, the ſanguineous and choleric are oftentimes blended together. You might find out other general deviations of the body from a middle ſtate, which might be called *temperamentum oleoſum*, *ſalinum*, *calidum*, *frigidum*,

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[*] Ariſtot. probl. xiii. 7. Petron. ſatir. § 128. Martial epigr. iv. 4.

† Vid. Boerh ubi ſupra.

‡ Vid. Boerh. inſt med § 99.

§ Hoffman. med. rat. i. p. 182.

‖ Vid. Aret. de chronic. cauſ. &c. i, 16. Cæl. Aurelian chronic. iii. 6.

frigidum, &c. as you pleaſe to conſider the various ingredients and diſpoſitions of the blood, and operations of the body.

23. Παντων δε αριστα διακειται ανθρωπος.---μηδεμιην δυναμιν ιδιην αποδεικνυμενος *. The blood then, which is as it were in a middle between all theſe, which has neither too much cruor, nor too much ſerum, (ουτε λιαν παχυ, ουτε λιαν λεπτον) †, nor too much earth, ſalt, or oil, nor the product of too weak, nor of too ſtrong a circulation, we call the blood of a *regular conſtitution*, or *middle temperament*, to which the reſt are to be referred, and which people are underſtood to mean, when they ſpeak of the blood in general, and in a ſound ſtate. Υγιαινειν μεν ουν μαλιστα, οκοταν μετριως εχη ταυτα της προς αλληλα κρησιος και δυναμιος και του πληθεος, και μαλιστα, ην μεμιγμενα η̃. Αλγεει δε, οκοταν τι τουτεων ελασσον, η πλειον ειη, και μη κεκρημενον η̃ τοισι ξυμπασιν ‡. And indeed we are all but too liable to a deviation from this deſirable middle ſtate. The blood of very young ones is generally thin and watery, that of old people, thick and black; but the middle-aged folks are readieſt to have a biliar and ſanguineous diſpoſition. Εν μεν τοις παμπαν νεοις το αιμα ιχωροειδες εστι και πλειον, εν δε τοις γερουσι, παχυ και μελαν, και ολιγον, εν ακμαζουσι δε μεσως ‖.

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[*] Hippocr. de vet. med. xxxv. 9.

[†] Ariſtot. hiſt. animal. iii. 19.

[‡] Hippocr. de nat. hum. vi. 1.

[‖] Ariſtot. hiſt. animal. iii. 19.

VII. *The Proportions of the chemical Elements.*

24. The antients did not pretend to determine the proportions their four elements bear to one another. But the chemiſts have had a better opportunity to make a tolerable eſtimate of the quantities of their principles of the human blood, which, however, you are not to expect as perfectly exact, or nearly alike in all trials. However, by way of example, we ſhall take an experiment of the accurate Mr Boyle *, who, by diſtilling ten ounces and ſeventy-three grains of human blood at a ſlow fire, found it to yield the following ſubſtances:

	Grains.
Phlegm riſing by a gentle heat, differing little † from common water, with two or three grains of volatile ſalt diſſolved in it, - - - -	3527
Volatile parts loſt in diſtillation, which we preſume to be of the ſame nature with the collected phlegm. - -	266
And ſo theſe two phlegms put together,	3793
The dry ſubſtance or reſiduum of this Diſtillation, - - - - -	1080
This reſiduum, diſtilled a ſecond time at a ſtronger fire, gave,	
Fetid oil, - - - - - -	168
Dry volatile ſalt purified from its adhering ſpirit, - - - - -	65

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* Hiſt. hum. blood, p. 231. Abr. iii. p. 459.

† Vid. Vieuſſens in phil. tranſ. 241. Abr. iii. p. 243.

	Grains.
Volatile ſaline ſpirit collected, -	48
Particles loſt, partly this ſaline ſpirit, and partly air, which in this period of the diſtillation begins to riſe *,	427
The air thrown off by ſuch a diſtillation, according to Hale's experiment †, ſhould be, - - - -	171
And ſo the ſpirit loſt was, - -	256
Which added to *gr*. 48, the former volatile ſaline ſpirit makes - -	304
Caput mortuum - - -	372
The *gr*. 268 of fetid oil analyſed in Vieuſſens's way ‡, ſhould have given,	
Saline ſpirit, - - - -	99
Yellow thick oil, - -	60
Fixed ſalt, - - -	3
Fixed earth, - - -	6
The *gr*. 304. and *gr*. 99. of ſaline ſpirit, making in all *gr*. 403, analyſed according to a like method ‖, ſhould have given,	
Water, - - -	278
Volatile ſalt, - - -	125
Caput mortuum, *gr*. 372, calcined, gave,	
Fixed ſalt, - - -	18
Moſt fixed earth, - -	26

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* Hales veg. ſtat. exp. xlix. p. 173. Exp. li. p. 174.

† Ibid. exp. xlix. p 173

‡ Phil. tranſ. 241. Abr. iii. p. 245.

‖ Boyle hiſt. hum. bl. p. 112. 125, 126. 142. Abr. iii. p. 473. 475.

	Grains.
Particles evaporated in the open fire,	328

The proportions of whoſe ingredients cannot well be determined; but, from ſome ſort of analogy, we gueſs them to be about theſe following, neglecting the air, which too perhaps was diſſipated at this time.

Oil,	273
Salt,	22
Earth,	33

From all which the blood being unity, conſiſting of *gr.* 4873, a chemiſt would reckon theſe elements in the following proportions:

Water	*gr.* 4068	$\frac{5}{6}$
Oil	333	$\frac{1}{15}$
Salt	190	$\frac{1}{25}$
Earth	65	$\frac{1}{75}$
Air	171	$\frac{1}{28}$

25. Thus we ſee how vaſtly the watery or phlegmatic part of the blood abounds above the other principles. It takes up $\frac{5}{6}$ parts of the whole maſs; and other experiments † ſhew it ſtill in a greater quantity: And it exceeds the oil or ſulphur above a dozen times; and the oil is in greater plenty than any of the reſt of the ingredients. However, I ſhall not ſay but ſome of theſe elements may ſtill be reſolved into one another, or into more ſimple parts, ſo as to increaſe or diminiſh the above proportions.

VIII. *The*

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† Boyle ſcept. chem. abr. iii. p. 286. Boerh. chem. ii. proc. 119.

VIII. *The proportional Quantities of the Globules of different Orders.*

26. But our main buſineſs, as being hitherto leſs minded by phyſicians, is rather to determine the proportions and various properties of the parts or elements of the blood, analyſed in the moſt ſimple, that is, (if on this occaſion we may be allowed the expreſſion) in a geometrical way, and to find out the ſeveral quantities of the globules of different orders. Now, in cold and ſufficiently coagulated blood, the tough craſſamentum, and its ſurrounding fluid, ſerum, are ordinarily found [†] to be pretty near equal to one another. And Dr Jurin [‡] ſuppoſes the interſtices of the red globules of the craſſamentum to be nearly equal to the globules themſelves, ſo as to render them $\frac{1}{4}$ of the whole maſs.

27. The interſtices would indeed take up almoſt ſuch a ſpace, if the globules were all regularly diſpoſed, ſo as to lie perpendicular over one another in a ſquare form. But it is plain they could not well ſubſiſt in that ſtate: Their natural lubricity would be readier to diſpoſe them in a more compact figure, as perhaps in a quincuncial order or ſo. And in ſuch a caſe, by a calculation, differing conſiderably from Tabor's [‖], I find that that the interſperſed ſpatiola put all together, would take up but $\frac{1}{4}$ of the

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[†] Vid. Boyle hiſt hum. bl. p. 252. Abr. iii, p. 460.

[‡] Phil. tranſ 361. Abr. v 1 p. 326.

[‖] Exerc med. i. 1. § 5 p. 61.

the craſſamentum, and the blood globules $\frac{3}{4}$ thereof: So that, on this ſuppoſition, theſe would be $\frac{3}{8}$ parts of the whole maſs. But neither is it likely they ſhould be ſo very regularly and compactly diſpoſed; and therefore, making ſome allowances for irregularities, it may ſeem reaſonable rather to reckon, that theſe globules ſhould take up only about $\frac{2}{3}$ of the craſſamentum, and conſequently $\frac{2}{6}$ or $\frac{1}{3}$ of the maſs, and the ſerous part to take up the other $\frac{2}{3}$ thereof. In this caſe the red globules being ſuppoſed to be ſcattered uniformly through the blood, their mean diſtance from one another, by a geometrical calculation, comes out about $\frac{1}{4}$ part of their diameters: And this falls in nearly with Tabor's † obſervation; which however I will not ſay was made, or could well be made with ſufficient accuracy.

28. Now, as the blood is a compound of globules of all the ſeveral orders, ſo is the ſerum a compound of globules of the ſecond order, and of all the inferior orders. And as the red globules, or thoſe of the firſt order, take up a third of the whole maſs; ſo from analogy, (and we have no other way left us to determine the matter), it is not improbable that theſe of the ſecond order ſhould take up a third part of the ſerum, and that the other two thirds are made up of globules of the third and ſubſequent orders, and ſo on in this progreſſion.

The entire maſs of blood, - - 1
Globules of the firſt order, - - $\frac{1}{3}$
Serum, - - - - $\frac{2}{3}$

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† Exerc. med. l. § 5. p. 69.

Globules of the ſecond order, -	$\frac{2}{9}$
The reſt of the ſerum, conſiſting of globules of the third and inferior orders,	$\frac{4}{9}$
Globules of the third order, - -	$\frac{4}{27}$
The remainder of the ſerum, being globules of the fourth and inferior orders, - - - -	$\frac{2}{27}$
Globules of the fourth order, - *q. p.*	$\frac{1}{10}$
The remainder, being globules of the fifth and inferior orders, -	$\frac{1}{5}$
Globules of the fifth order, - -	$\frac{1}{15}$
The remainder, being globules of the ſixth and inferior orders, - -	$\frac{2}{15}$
Globules of the ſixth order, -	$\frac{1}{45}$
Aggregate of the ſeventh and inferior orders, - - -	$\frac{4}{45}$
Globules of the ſeventh order, - *q. p.*	$\frac{1}{34}$
Aggregate of the eighth and inferior orders, - - -	$\frac{1}{17}$
Globules of the eighth order, -	$\frac{1}{31}$
Aggregate of the ninth and inferior orders, - - - *q. p*	$\frac{1}{35}$
Globules of the ninth order, -	$\frac{1}{75}$
Aggregate of the tenth and inferior orders, - - - *q. p.*	$\frac{1}{38}$
Globules of the tenth order. -	$\frac{1}{114}$
Aggregate of the globules of the eleventh and inferior orders, if there be ſuch, - - -	$\frac{1}{57}$

IX. *The Denſity of the Maſs of* Blood.

29. Having thus conſidered the ſeveral quantities of the compounding particles of the blood, it is convenient next to determine their

ſpecific weight or quantity of matter contained under a given bulk, comparing them, as alſo the entire ſanguineous maſs, to ſome other body of a fixed and determined denſity, as common water, which is the ordinary ſtandard for ſuch calculations.

The truly honourable Mr Boyle †, as he began a great many curious reſearches of this kind; ſo he was the firſt who attempted to ſettle the comparative weight of human blood, which, according to his trial, came out to be to water as 1041 to 1000. But as his experiment was not done with that accuracy as to ſatisfy himſelf, who in every thing was very ſcrupulous, he recommended it to the farther inquiry of others. And accordingly, the accurate Dr Jurin ‡, by a ſet of experiments of this kind, found the denſity of the blood to be 1054. As far as I can judge, by comparing it with rain water, or that of a clear limpid rivulet, but differing little from rain water, and, taking great care that there be no bubbles of air in the blood, when I made my experiments, I found their denſities as 1000 to 1056, or 1057, or as 18 to 19. *q. p.* Perhaps the water I uſed being lighter than the common London water, which I preſume was made uſe of in Jurin's experiments, might occaſion this ſmall variation.

30. But we muſt obſerve a very remarkable difference in the blood, according to its different ſtates; whether as circulating in the veſſels of the animal, or as it is expoſed to the

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† Hiſt. hum. bl. p 36. Abr iii. p. 450.

‡ Phil. tranſ 361. Abr. v. 1. p. 324.

cold air; in which condition we commonly examine it: From whence, after ſufficient allowances, we muſt inveſtigate its real and natural denſity, while in a live ſtate.

We know all bodies whatſoever to be ſomewhat condenſed by cold, and expanded again by heat; ſo that we can ſafely affirm the cold blood to be ſpecifically heavier than the warm fluids circulating in the veſſels of a living animal; but by how great an odds, is not ſo obvious or eaſy to be determined.

31. Some people ſeem to eſtimate the heat and denſity of the living blood, according to what they find it upon its firſt emiſſion out of the body: In which caſe it is plain, that in its very exit, and while you collect a ſufficient quantity to make your experiment, it has loſt conſiderably both of its heat and natural expanſion.

32. One would be ready to judge of the expanſion of blood, from what we find it in water. Now Dr Halley * found waters, reaſonably cold, but not freezing, to be expanded $\frac{1}{26}$ part by boiling; that is, as I judge, from grad. 2. to grad. 34½, in a thermometer conſtructed in Sir Iſaac Newton's way: The ſame difference was aſſigned by Leuwenhoek †. Whence water in a temperate degree of heat, about grad. 4, ſhould be expanded $\frac{1}{93}$ part, by the heat of grad. 12 $\frac{8}{10}$, to which I find the thermometer riſes by the blood of thoſe living animals, whoſe vital operations come neareſt to

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* Phil. tranſ. 197. Abr. ii. p. 34.

† Arcan. nat. det. epiſt, lxviii. p. 214. See too M. de Reamur mem. de l'Acad. des ſciences 1730, p. 691.

to the human, not grad. $14\frac{3}{11}$, as Sir Iſaac Newton * and Mr Hales †, by ſome miſtake reckoned it. But, by repeating ſome experiments of this nature, I could not perceive the expanſion to be near ſo great, as is deduced from Halley's and Leuwenhoek's experiments. Perhaps, in their boiling water, there were ſome air-bubbles which they did not conſider.

33. This makes me ſuſpect ſome miſtake to have been likewiſe in Dr Tabor's ‡ experiment, by which he determined the cold ſerum, when brought to the temperature of living blood, to be expanded $\frac{1}{81}$ part.

If theſe authors have aſcribed too great a dilatation to water or blood heated to a certain degree, I ſuſpected that on the other hand Dr Boerhaave had allowed water too ſmall a rarefaction, when from grad. 56 in Fahrenheit's thermometer to grad. 212, when it was in a boiling ſtate, he reckoned it dilated only $\frac{1}{85}$ part; and conſequently from grad. 53 (which coincides with grad. 4 in Newton's thermometer) to grad. 100, (which nearly anſwers to Newton's grad. 12, 8) it ſhould be no more than $\frac{1}{180}$ part.

34. Weighing carefully a certain quantity of human blood, drawn from a man in health in the morning, and flowing directly into a phial that was immerſed in water, which raiſed the liquor in the thermometer to grad. 12, 8, and then letting it cool in a temperate ſtate of air about

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* Phil. tranſ. 270. Abr. iv. 2. p. 2.

† Veg. ſtat. l. exp. 20. p. 58.

‡ Exerc. med. l. 1. § 7. p. 63.

about grad. 4, I found it condenſed $\frac{1}{135}$ part. So that the denſity of the blood, when circulating in living animals, is to its denſity when reduced to the coldneſs of temperate air, as 134, to 135, or 992 $\frac{1}{2}$ to 1000. Water and urine tried the ſame way ſuffered very near the ſame degrees of rarefaction and condenſation. Hogs blood ſeemed to undergo ſome greater change: But the difference was very ſmall; no greater than what might flow from a greater quantity of oily particles in its compoſition: And we know oil is more rarefied by a given degree of heat than water.

35. There is however one conſideration too often neglected; but which nevertheleſs muſt be taken in, before we can apply our calculations with the deſired accuracy to liquors in different degrees of heat. The veſſels, in which our areometrical experiments are performed, ſuffer likewiſe a dilatation, by the application of heat, though in a much leſs degree than the contained fluids. It is the exceſs of the expanſion of theſe above the dilatation of the containing veſſels, that is commonly recorded in obſervations of this kind. But they muſt both of them be taken in to determine the real changes the fluids undergo in the different ſtates of heat and cold. Glaſs I ſuppoſe from good reaſons may be lengthened by the heat of the human body about $\frac{1}{1200}$ part of its dimenſions; ſo that a thin glaſs phial ſhall be enlarged in its contents about $\frac{1}{400}$ part. Whence the real denſity of cold blood, to its denſity when circulating in a live animal, comes out in compound ratio of 135 to 134,

and 400 to 399, which is nearly, as 100 to 99. And ſo, from what has been ſaid, we may conclude the real denſities of water and blood to be in theſe proportions,

Water in a temperate degree of heat,	1000
freezing, - - -	1004
of the heat of the blood in the human body, - -	990
Blood of the heat of temperate air, -	1056
in its natural living ſtate, -	$1045\frac{4}{9}$

36. Hence we ſhall be able to determine the weight of a given moles or bulk of blood, which is not ſo accurately done hitherto as it deſerves : This being of ſingular uſe in our inquiries concerning the velocities, moments, &c. of the circulating liquors, and the forces of the heart, and other organs in the animal machine.

From the accurate experiments of Dr Bernard, Sir Iſaac Newton, Mr Everhard, and others, we conclude a cubic inch of rain water to weigh $253\frac{1}{3}$ grains. Whence a cubic inch of warm blood ſhall be found equal to *gr.* $253\,\frac{1}{3} \times \frac{1045}{1006} = 264\,\frac{3}{4}$: And an ounce of blood will be 1,813 inches. An averdupois ounce, (which nearly coincides with the antient Roman ſtandard weight), according to the very nice experiments of Mr Everhard, and Mr Stewart profeſſor of Natural philoſophy in the univerſity of Edinburgh, is found to weigh *gr.* $437\,\frac{1}{2}$; and therefore is in water equal to 1,727 inches; and 1,6526 inches of warm blood.

Seeing from the principles of geometry, a cube is to its inſcribed ſphere, as 1 to 0, 5236, it eaſily follows that a globe of water of an inch diameter muſt be *gr.* $253\frac{1}{3} \times 0, 5236 =$ $132\frac{2}{3}$ *q. p.* and a ſphere of blood of the ſame ſize ſhall weigh *gr.* $138\frac{5}{8}$.

X. *The Denſities of the Globules of different Orders.*

37. And now we come more cloſely to work, to determine the denſities of the ſeveral parts of the ſanguineous maſs, wherein Mr Boyle, otherwiſe very accurate, has led very many leſs-examining people into a moſt enormous error, when, by ſome miſtake or other in theſe experiments * he moſt truſted to, he reckoned the ſpecific weight of ſerum to that of water, as 1174 to 1000, and conſequently a good deal heavier than that of the common maſs or red blood. A thouſand obſervations and circumſtances may convince us of the contrary; but we ſhall confine ourſelves to theſe experiments that determine directly their ſpecific weights with the greateſt accuracy. We formerly † found the denſity of cold blood to be 1054, or rather 1056: And Dr Jurin ‡, from a great many trials, all done with utmoſt care, concludes the ſpecific weight of ſerum to be only 1030. Dr Tabor's § obſervation makes it 1031: And I found it nearly the ſame. So that, when compared to limpid rain water, it

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* Hiſt. hum. Bl. p. 71. Abr. iii. p. 461.

† § 29.

‡ Phil. tranſ. 361. Abr. v. 1. p. 323.

§ Exerc. med. l. 1. § 7.

it may ſafely enough be reckoned 1032, which is then $\frac{1}{43}$ part lighter than blood. The ſerum, therefore, when reduced to the heat of live blood, ſhould be $1032 \times \frac{99}{100} = 1021\frac{2}{3}$.

38. Since the craſſamentum is about one half of the whole maſs [*], it, when taken by itſelf, muſt as far exceed in denſity the common maſs as this does the ſerum; and conſequently ſhould be 1080; to which ſupputation experience comes very near. For, as a medium of ſeveral trials, Dr. Jurin [†] found it 1084. The very different conſiſtence of the craſſamentum of the blood of different perſons, will not allow us to expect a great uniformity on ſuch experiments; however I found it generally ſomething above 1080. Perhaps the handling of it might have ſqueezed out ſeveral of the thinner and lighter particles of the interſperſed ſerum; ſo that we found it ſpecifically heavier than naturally it ſhould have been.

39. About two thirds of this maſs of craſſamentum is taken up by red globules, the other third by ſerum [‡]; from whence the denſity of theſe globules is found 1104. It comes out the ſame from our former determinations of the denſity of ſerum, as 1032 [§], and that of blood as 1056 [‖]; and the red globules being a third of the entire maſs of blood [**]. It is true, Dr Jurin reckoned [††] the ſpecific gravity of

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[*] § 26.

[†] Phil. tranſ. ibid. p. 327.

[‡] § 27.

[§] § 37.

[‖] § 29.

[**] § 27.

[††] Phil. tranſ ibid. p. 326. 327.

the blood globules to be 1126; but he ſuppoſed the quantity of theſe globules only a fourth part of the whole maſs; whereas the reaſons formerly adduced obliged us to reckon them a third thereof. So then the true denſity of a red globule, circulating in the blood of a living man, is $1104 \times \frac{99}{100} = 1093$.

40. And thus we have found that the red globules, or thoſe of the firſt order, are the heavieſt parts of the blood; and that they, as well as the groſſer ſerum, by being broken down into ſmaller globules, loſe ſomething of their ſpecific weight: So that it is very obvious to infer, that as the globules of the firſt order are the denſeſt, as well as the biggeſt particles of the blood, ſo theſe of the ſecond order come neareſt to them in each of theſe properties: Theſe of the third order, as they are ſmaller, ſo are they ſpecifically lighter than the preceeding, but bigger and heavier than the globules of the fourth, or ſubſequent orders, and ſo on: The globules of the larger ſize always having their compounding elements more ſtraitly compacted than the ſmaller ones, whoſe parts are not ſo ſtrongly bound to one another: So that we are to conceive the maſs of blood, as made up of a congeries of ſpherules differing in denſity as well as magnitude.

41. We have been able to determine the real denſity of the red globules; but how ſhall we arrive at any knowledge of the globules of the inferior orders? Nature makes no ſeparation of them from one another out of the animal; nor do we know, by any art, a method

of reducing them into diſtinct parcels. But, notwithſtanding theſe diſadvantages, we are not to deſpair of coming at a determination of this ſo ſeemingly difficult queſtion. We have the denſity of the maſs of blood 1045 *; of the red globules 1093 †, and of the ſerum 1022 ‡; and, from theſe three data, we ſhall neceſſarily have a very regular and conſiſtent ſeries, if we reckon the differences of the denſity between any order, and its ſubſequent one, to be a third part greater than the difference between that ſubſequent one, and what immediately ſucceeds it. Thus, if α, β, γ, δ, &c. be the denſity of the orders A, B, C, D, &c. then $\alpha - \beta \times \frac{2}{3}$ will be equal to $\beta - \gamma$, and $\beta - \gamma \times \frac{2}{3}$ equal to $\gamma - \delta$, and ſo on; theſe differences of denſities decreaſing in a geometrical proportion; ſo that at length the very minute globules of the inferior orders come all to be nearly of the ſame ſpecific weight. By this rule the ſpecific weights of the ſeveral orders of globules are in the following proportions:

The maſs of warm blood, or the globules of the firſt and all the ſubſequent orders, - - -	1045
Globules of the firſt order, - -	1093
The ſerum or globules of the ſecond, and all the ſubſequent orders. -	1022
Globules of the ſecond order, - -	1053

Globules

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* § 35.
† § 39.
‡ § 37.

Globules of the third and ſubſequent orders,	1006
Globules of the third order,	1027
Globules of the fourth and ſubſequent orders,	995
Globules of the fourth order,	1009
Globules of the fifth and ſubſequent orders,	988
Globules of the fifth order,	998
Globules of the ſixth and ſubſequent orders,	984
Globules of the ſixth order,	990
Globules of the ſeventh and ſubſequent orders,	980
Globules of the ſeventh order,	985
Globules of the eighth and ſubſequent orders,	978
Globules of the eighth order,	981
Globules of the ninth and ſubſequent orders,	977
Globules of the ninth order,	979
Globules of the tenth and ſubſequent orders,	976
Globules of the tenth order,	977

42. We are not to wonder that the globules of the ſeventh, and all the lower orders, are ſpecifically lighter than water of the ſame degree of heat; they take up only the eleventh part of the maſs of blood *. And the liquors of our bodies are all ſtored with oily light particles, and that in greater abundance than either with ſalt or earth †; which therefore are

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* § 28.

† § 24.

are capable to render the parts of the blood lighter than water, were it not that the *vis vitæ* conſtantly operating in the animal machine, the ſanguineous elements are wrought up, and compacted together in ſuch a way as to render all the larger-ſized globules much denſer, and the whole maſs conſiderably heavier than water.

XI. *The Diameters, Magnitudes, Weights*, &c. *of the Globules of the Blood.*

43. From the conſtruction of the blood formerly deſcribed *, it is plain, that the quantity of matter of the globules of any order is ſixfold the quantity of matter of the globules of the next ſucceeding order; and the ſame ratio would hold of their bulk or ſize, if they were all of the ſame denſity. But, by their variety in this reſpect, their bulks or magnitudes do not exactly follow this proportion; for theſe are directly as their quantities of matter, and inverſely as their reſpective ſpecific weights. And their diameters are as the cube roots of theſe magnitudes. Thus the magnitude of a red globule, is to that of a globule of the ſecond order in a compound ratio of 1 to $\frac{1}{6}$ directly, and 1093 to 1053 reciprocally; that is, as $\frac{1}{1093}$ $\frac{1}{6,1053}$, or as 1 to $\frac{1}{5,78}$. And their diameters as $\sqrt[3]{1}$ to $\sqrt[3]{\frac{1}{5,78}}$, that is, as 1 to $\frac{1}{1,795}$, and ſo on of all the reſt as in the following table.

The

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* § 9. &c.

The Orders of Globules.	Quantities of Matter of the Globules.	Magnitudes of the Globules.	Diameters of the Globules.
1	1	1	1
2	$\frac{1}{6}$	$\frac{1}{5{,}78}$	$\frac{1}{1{,}795}$
3	$\frac{1}{36}$	$\frac{1}{33{,}83}$	$\frac{1}{3{,}234}$
4	$\frac{1}{216}$	$\frac{1}{199{,}4}$	$\frac{1}{5{,}842}$
5	$\frac{1}{1296}$	$\frac{1}{1182}$	$\frac{1}{10{,}57}$
6	$\frac{1}{7776}$	$\frac{1}{7043}$	$\frac{1}{19{,}17}$
7	$\frac{1}{46656}$	$\frac{1}{42033}$	$\frac{1}{34{,}77}$
8	$\frac{1}{279936}$	$\frac{1}{251249}$	$\frac{1}{63{,}1}$
9	$\frac{1}{1679616}$	$\frac{1}{1504400}$	$\frac{1}{113}$
10	$\frac{1}{10077696}$	$\frac{1}{9000000}$	$\frac{1}{208}$

44. Theſe are the proportions the ſeveral orders of globules bear to one another: But it will be required to determine, if poſſible, their real dimenſions compared to ſome known magnitude. It is ſatisfying and uſeful, as well as curious, to reduce to meaſure and weight the ſubtile particles of matter. The beſt philoſophers of all ages have been very ſolicitous in their inquiries about them, as being the chief ſprings of the operations of nature. Many had aſſigned to the heavenly bodies their proper dimenſions; but the great Sir Iſaac Newton, by an incomparable ſtrength of genius, found out their real weights, or quantities of matter, and, as it were, put the ſtupendous maſſes of the ſun and planets in the ſcales; an attempt which our forefathers would have thought beyond the reach of mortals! But ſtill he is as much admired; and ſurely we are more indebted to him for his wonderful diſcoveries concerning the inconceivably minute particles, the rays of light; and the ſeveral very minute thickneſſes of Bodies reflecting all the ſeveral ſorts of rays of different ſizes and orders, and producing all the various colours in the univerſe. And no true philoſopher will judge it a fruitleſs or vain undertaking to inveſtigate the real ſizes of the particles or globules of the blood. They are a part of ourſelves, and a conſiderable ingredient in our very beings.

45. Mr Leeuwenhoek, who ſpent his life in microſcopical obſervations; and in particular, very often viewed the blood through his moſt excellent glaſſes, uſed to reckon

[*] the diameter of a red globule of the firſt order to be the $\frac{1}{100}$ part of the diameter of a large grain of ſand, and conſequently $\frac{1}{1000000}$ part of its bulk. But this is ſomewhat too vague; he not having carefully or poſitively enough determined the real diameter of ſuch a grain of ſand, compared to ſome known meaſure: However, we may preſume he meant by it a grain of ſand of the larger ſort, the thickneſs whereof he judged to be about $\frac{1}{30}$ part of an inch [†]; and conſequently an inch ſhould be 3000 times broader than the diameter of a red globule. Dr Tabor [‡] computed it $\frac{1}{1600}$ of an inch. But his method is not capable of the deſired exactneſs. Dr Jurin [‖], taking a very pretty way of inveſtigating the true ſize of very ſmall bodies, reckoned the diameter of a globule of blood to be $\frac{1}{3240}$ part of an inch. But, as this was deduced from an obſervation, the circumſtances of which were not ſo very accurate as one could have wiſhed, that defect was amply ſupplied by ſome ſubſequent obſervations carefully made by him, and then confirmed by Leeuwenhoeck himſelf; whereby they both found the apparent diameter of a red globule to be exactly $\frac{1}{1940}$ part of an inch [**]. If this globule be ſuppoſed circulating in our body, and heated to the ordinary degree of living blood, then indeed its diameter will be ſomething enlarged, to wit, in the ratio of

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[*] Anat. & contempl p. 35. & paſſim alibi.

[†] Ibid. p. 39.

[‡] Exerc med. l. 1. § 3.

[‖] Phil. tranſ. 355. Abr. iv. 1 p. 444.

[**] Phil. tranſ. 377 p. 341.

$\sqrt[3]{100}$ to $\sqrt[3]{99}$ *, which is nearly in the ratio of 300 to 299. Whence the true diameter of a red globule in its natural ſtate comes out $\frac{1}{1940} \times \frac{300}{299}$, or, $\frac{1}{1933,5}$, part of an inch. In the ſame manner the diameter of a globule of the ſecond order is equal to $\frac{1}{1933,5 \times 1,795}$, or $\frac{1}{3470,6}$ part of an inch: And ſo on through the other orders as in the following table.

Orders of globules.	Diameters of the globules in parts of an inch.	Orders of globules	Diameters of the globules in parts of an inch.
1	$\frac{1}{1933,5}$	6	$\frac{1}{37065}$
2	$\frac{1}{3470,6}$	7	$\frac{1}{67228}$
3	$\frac{1}{6253}$	8	$\frac{1}{22000}$
4	$\frac{1}{11295}$	9	$\frac{1}{218500}$
5	$\frac{1}{20437}$	10	$\frac{1}{402170}$

46. Perhaps it may be worth while to obſerve, that Sir Iſaac Newton † has determined the thickneſs of a particle of water reflecting

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* § 35.

† Optics ii. p. 206.

ing ſcarlet of the ſecond order of colours to be $\frac{14,75}{1000000}$ parts or $\frac{1}{67797}$ part of an inch, which almoſt coincides with $\frac{1}{67228}$ part of an inch, the diameter of the globules of the blood of the ſeventh order.

47. From hence it will be eaſy to determine the real magnitudes of the globules of each of theſe orders, compared to ſome known meaſure. The bigneſs, for example, of a globule of the firſt order is to a ſphere of an inch diameter, in the triplicate ratio of 1 to $1933\frac{1}{2}$, which is as 1 to 7228240000. And the bigneſs of the other globules are readily found in the ſame way.

48. A ſphere of water of an inch diameter was obſerved to * weigh gr. $132\frac{2}{3}$; and therefore a ſphere of matter of the ſame denſity with the red globules of blood, ſhould weigh gr. $132\frac{2}{3} \times \frac{1093}{1000} =$ gr. 144,986; conſequently a grain ſhould be ableto counterpoiſe $\frac{7228240000}{144986}$ or 49854600, that is, near fifty millions ſanguineous globules of the firſt order. What a prodigious minuteneſs does this ſeem to be! And yet theſe are the biggeſt particles that naturally exiſt in the circulating fluids of the human body; and immenſely bigger than the leſſer-ſized globules: And all of them are again to be conceived as made up ſtill of minuter particles and elements of different kinds.

"Thou haſt ordered all things in meaſure, and number, and weight. I will praiſe thee, (O God), for I am fearfully and wonderfully made: Marvellous are thy works, and that my ſoul knoweth right well." Wiſd. xi. 20. and Pſal. cxxxix. 14.

VIII.

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* § 36.

VIII. *The Experiment of cutting the Reccurrent Nerves carried on farther than has hitherto been done. In a Letter from Dr* GEORGE MARTIN, *Phyſician at* St. Andrew's, *to Mr* Monro, *Profeſſor of Anatomy at* Edinburgh, *by whom it was communicated.*

THE moderns have acquired a much exacter knowledge of the ſtructure of the human body than the antients could poſſibly come at. We have the advantage of the time and pains they laid out in making their obſervations: And beſide, can boaſt of many opportunities they were intirely deſtitute of. Yet we cannot but admire theſe great men, if we will form a judgment of them from the monuments of their genius and induſtry they left behind them, though ſome of theſe are loſt, and many of them, though preſerved in books, are ſometimes too much ſlighted by the over negligent poſſeſſors of theſe treaſures.

2. The firſt phyſicians had but a very faint notion of the brain preſiding over the animal ſyſtem by the mediation of the ſpinal marrow and nerves produced from it, and diſtributed to the reſt of the body. And we muſt acknowledge this was not ſufficiently underſtood before Herophilus and Eraſiſtratus, the greateſt anatomiſts of antiquity, who explained this ſcheme, and left the world no room to doubt of this elegant piece of mechaniſm of the animal body. Phyſicians began to diſſect with more

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Fig. 1.

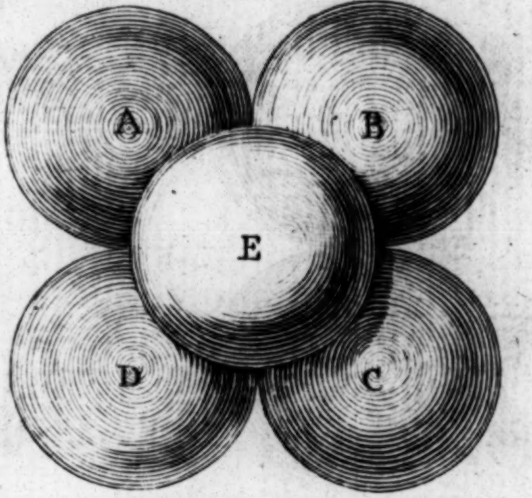


Fig. 3.

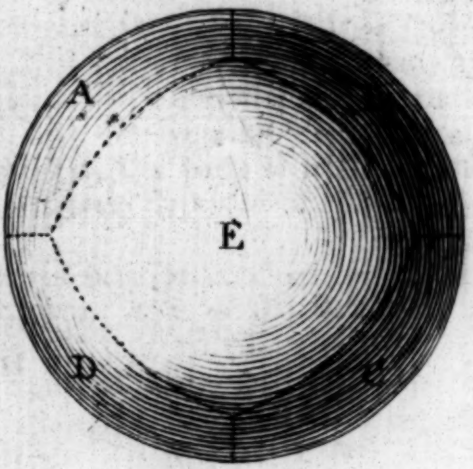


Fig. 2.

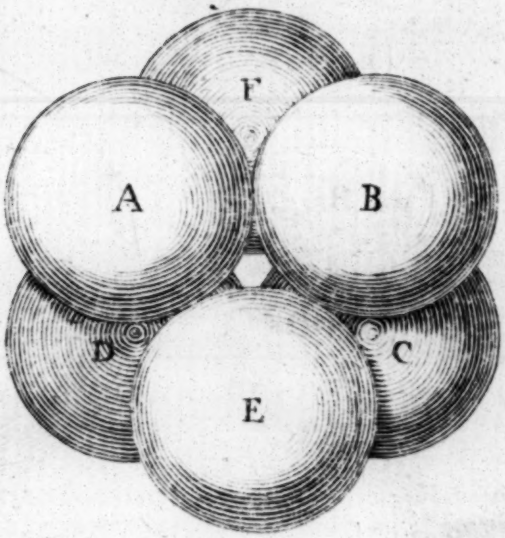


Fig. 4.

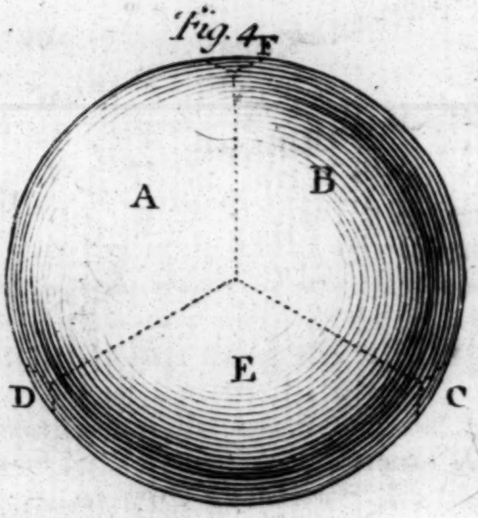
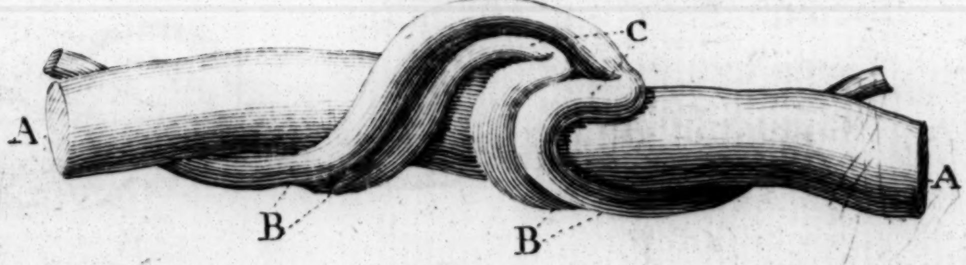


Fig 5.



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more than ordinary care both living and dead animals; and they ſoon found, that, by cutting, tying, or compreſſing any nerve, or any other way intercepting its communication with the brain, the parts to which it belonged were immediately deprived of all ſenſe and motion.

3. It was eaſy to confirm this doctrine by experiments on any of the ordinary nerves. But one of the pretticſt inſtances of it, was the making ligatures upon the veſſels at the ſide of the wind-pipe, and immediately ſtriking the animal dumb, however noiſy it was before. The firſt makers of this experiment thought the animal turned comatous, or fell aſleep; and aſcribing this effect to the intercepting any paſſage of vital blood from the heart to the brain, by the way of the arteries; they gave theſe blood-veſſels the name of Carotids, καροτιδων But, in the days of Ruffus *, this ſudden ſilence of the animal was found to proceed from the tying of the adjacent nerves. And Galen, who ſeems to have laboured this affair more than any of his predeceſſors, evidently proved †, that tying the arteries ſolely produced little change on the animal. In this caſe, (laying aſide the captious cavils and oppoſitions of Hoffman, Vanderlinden, Wepfer, and others of the moderns, who diſputed againſt the experiment, which, however eaſy, they would not take the trouble to repeat), we muſt conceive the brain to have been furniſhed

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* De app. part i. 34.

† De decr. Hipp. &c. ii. 6. De util. reſp. v.

by the vertebral arteries. And ſo he found all that the animal ſuffered in the experiment of tying the whole veſſels at the ſide of the trachea, to be a ſudden obmuteſcence; which entirely proceeded from the intercepting the nervous influence on the muſcles of the larynx: For he diſcovered * that theſe nerves were derived from the par vagum; and that they, making a turn under the right ſubclavian artery, and deſcending aorta, climbed up along each ſide of the wind-pipe, to furniſh theſe muſcles.

4. The oddneſs and novelty of all this doctrine was in thoſe days ſurpriſing †. The virtuoſi at Rome knew nothing of it; yea Alexander of Damaſcus, the Peripatetic, and preceptor of Boethius, was reſolved to deny and oppoſe it at any rate. He would rather reſiſt the evidence of ſenſe, than yield any thing that might contribute to the riſing glory of Galen his rival. But our anatomiſt, in the midſt of a learned and judicious aſſembly, conſiſting of adverſaries as well as friends, by ocular demonſtration, gave them at once a convincing proof of the truth of his doctrine, and of his own extraordinary ſkill in diſſections. Yea this was confirmed by ſome caſual obſervations made on ſome of our own ſpecies ‡. An unlucky ſcrophulous boy, falling into the hands of an ignorant ſurgeon, loſt the half of the ſtrength of his voice, by having one of the recurrent nerves cut along with the tumor. How-

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* De uſ. part vii. 14. xvi. 4. De loc. affect. i. 7.

† De præcog. ad poſthum. v.

‡ Galen. de loc. affect. i. 7.

However he eſcaped better than another boy who in the like caſe was indeed cured of the ſtrumæ; but, having both the recurrents extirpated, was left quite dumb.

5. This experiment of cutting theſe nerves in brutal animals, was repeated and confirmed by Veſalius *, otherwiſe, you know, no great favourer of the doctrines or glory of Galen. And I myſelf, about twelve or thirteen years ago, when I was firſt ſetting out to make ſuch experiments, trying it in a pig, with all the circumſpection I was then capable of, found it to anſwer exactly. So that tho' this elegant operation has been much out of uſe among the moderns, inſomuch that one might have ſuſpected it had been given over for want of ſucceſs; yet, however great regard I have to your judgment and great ſkill in anatomy, I could not conſent to you, when, from a preconceived theory, you ſeem to think † 'it probable the voice would not be entirely loſt, 'tho' both the recurrent nerves were cut, ſo 'long as the ſuperior branches ſtill ſupply the 'larynx.' It is true that Galen ‡ himſelf taught, that there was on each ſide an inoſculation of the extremity of the recurrent, with one of the ſuperior branches of the eighth nerve. This was copied by Nic. Maſſa, painted by Euſtachio, and confirmed by Willis and the moderns: But ſtill, on diſſection, I could not find that there was any regular diſtribution of nerves to the proper muſcles of the larynx, from any other origin

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* Hum. corp. fab. vii. 19. p. 521.

† Of the Nerves, p 19.

‡ De uſu part. xvi. 4.

beſide the recurrents. This, you know, I gueſſed to be the caſe: And now I find it to be true in fact.

6. It is plain then, that the voice muſt be loſt, however ſound and free we ſuppoſe the ſuperior branches of the par vagum. But ſtill there is ſome hankering doubt in this affair; and it is propoſed to try this over again, and keep the animal alive ſome weeks, to ſee if the voice would at all return. We know not of any of the antients carrying on the experiment thus far; except we ſay Galen's ſcrophulous boys ſhow the abſolute irrecoverableneſs of the voice. But, to put the matter beyond all doubt, I repeated the experiment this ſpring on a young ſow five or ſix weeks old, ſome days before it was weaned from ſucking, and took greater notice of all the circumſtances than I had done formerly. I could obſerve with the antients, and ſo did two curious young gentlemen who aſſiſted me, that, upon cutting the nerve on one ſide, the voice was not deſtroyed, only it became weaker; but, upon cutting the other, it was entirely loſt, tho', by the ſound of the breath, and the motion of the thorax, you would manifeſtly have ſeen a fruitleſs conatus, and the creature ſtraining to make a noiſe. And ſo I very well underſtood Veſalius, when he ſays, "Pulchre auditur quam "validam efflationem animal citra vocem moli"atur, recurrentibus nervis cultello diviſis." The creature, when diſmiſſed, ſeemed well enough, ſucked the mother for ſome days, lived with the reſt of the litter ſeemingly hearty and well, tho' always dumb. It could indeed make

ſome little, juſt audible, grunting noiſe†, but could never give a ſqueek in the ordinary manner of theſe animals. From the beginning it breathed as if the glottis were too wide, eſpecially in the heat of the day: And this difficulty in ſome weeks began to increaſe upon it; ſo that, in proceſs of time, it became more lazy and ſolitary, frequently retired to the ſhade by itſelf; by degrees loſt its ſtrength and appetite, pined away, and at length in about ſix or ſeven weeks died. Upon inſpecting the larynx, I could not ſay it had undergone any great or remarkable change. The orifices of the ventricles ſeemed, I thought, laxer, and a little above them the membrane of the glottis was ſomewhat inflamed on each ſide.

7. The antients knew, that the noiſe of the voice depended on a due narrowneſs of the aperture of the glottis. And the author of the book *de voce et anhelitu* ‡, aſcribed to Galen, expreſsly affirms, *Si inſtrumenta vocis ampliſſima eſſent, tunc vox deſtrueretur*: So that, on the cutting the recurrent nerves, we are to conceive the glottis to ſtand open, and not to be ſhut at the pleaſure of the animal. And what elſe indeed can we expect, when the nervous influence on the muſcles belonging to the arytænoid cartilages is taken away in ſuch a manner that they can never can be brought to a due conſtriction, nor the ventricles of the larynx ſuffer any variety of contraction and dilatation.

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† This grunting noiſe, and the barking of a whelp, whoſe recurrent nerves were tied by Morgagni, (Epiſt. ad Valſalv. xiii.) ſeem to prove Mr. Monro's aſſertion, that the voice would not be entirely loſt, tho' both the recurrent nerves were cut.

‡ Tract iii. p 63.

An ESSAY on the Nutrition of Fœtuſes, *by* ALEX. MONRO, *Profeſſor of Anatomy in the Univerſity of* Edinburgh, *and* F. R. S.

WHILE our ſenſes and judgment are in the preſent imperfect ſtate, it is no wonder that men ſhould differ widely in their opinions of things, and ſo in the conſequences they draw from the appearances in nature. Such is the caſe at preſent between my ingenious valuable friend Mr Gibſon and me. He has given a learned critical account of the different opinions concerning the 'nouriſhment of fœtuſes' in Art. XIII. of your firſt volume, where, after examining the arguments made uſe of for proving their nouriſhment to be conveyed by the navel only, he concludes them to be inſufficient, and ſupports the doctrine of the aliment being received by both the mouth and navel. I formerly wrote Mr Cheſelden, and he publiſhed ſome facts, ſerving principally for proving the negative of a fœtus taking its food at the mouth; ſo that Mr Gibſon very juſtly names me as one of thoſe who differ in opinion from him, which I cannot help doing ſtill; and therefore believe myſelf engaged to give my reaſons of diſſent; ſince there is no certainty that Dr Bellenger, whom he more directly attacks, either has ſeen, or will anſwer my friend's eſſay.

The work you are engaged in does not ſeem to admit of numerous defences, replies, &c which ſometimes diſputes are liable to run into; and you have given a ſtrong caution to your correſpondents to beware of indecent expreſſions. I hope both theſe inconveniencies will be prevented here; for Mr Gibſon has already mentioned the moſt material arguments made uſe of to ſupport the doctrine he favours; and I ſhall faithfully repreſent any other reaſons furniſhed by books, or my own reflexions, which favour his ſide of the queſtion; and therefore replies will be at leaſt ſhorter, if not unneceſſary; and this way of managing the diſpute will ſhew you, that there is no great anxiety on my part to bring people, at any rate, into my way of thinking; and I dare promiſe on Mr Gibſon's behalf, that he will not value a victory in point of argument near ſo much, as he would be ſatisfied to ſee the truth aſcertained by our labours, tho' judgment ſhould be given againſt him. In ſhort, gentlemen, our caſe is that of two friends differing in opinion in an inquiry after truth, and, not being able to convince each other, are willing to appeal to better judges, that they may determine who has the greateſt probability on his ſide, without believing our honours at ſtake, which ever way ſentence is given.

I ſhall paſs without any examination Alcmoeon's opinion of the fœtus receiving its nouriſhment by the pores or veſſels on the ſurface of its body, while it is a forming; both becauſe there are no experiments for proving whether the veins there take in more at this time, than the arteries throw out; and that it is not the ſubject of the preſent queſtion, which only concerns the fœtus after it is formed; whoſe nouriſhment is now allowed by all, either to paſs from the amnios by the mouth into its chylopoietic organs; or to be conveyed into its blood-veſſels, by means of the umbilical veſſels; or to be furniſhed by both. I maintain the ſecond of theſe opinions, and therefore endeavour to render the other two improbable; by which you ſee I am under the diſadvantage of ſupporting a negative proof.

The determination of the queſtion, as now ſtated, may be reduced to the ſolution of the few following problems.

I. How far the mouth, or umbilical veſſels are neceſſary to the nouriſhment of fœtuſes.

II. Whether the liquor of the amnios is proper food for a fœtus.

III. Whether this liquor paſſes into the ſtomach of a fœtus.

In this paper I ſhall only conſider theſe problems, ſo far as they relate to viviparous animals, and ſhall ſoon ſend you a ſequel to it, wherein I ſhall examine, 'How far the analogy 'of oviparous animals, and of plants, ſerves to 'explain or confirm the ſolutions which I give 'to the foregoing problems.'

In treating this ſubject, I muſt beg leave to throw away that humble regard to authority, which bore ſovereign ſway in the ſchools of phyſic ſo long, and to paſs all the hypothetical reaſonings to be met with in books, unmentioned. It is only well vouched facts, and reaſonable conſequences from them, that

I will take any notice of; for on theſe, and theſe only it is, that a rational foundation of any part of medicine can be laid. The firſt thing therefore which I ſhall do, is to ſet down ſuch facts as I may have occaſion to aſſume in my ſubſequent reaſoning, together with ſome others, ſerving either to confirm and eſtabliſh thoſe, or to render them more clear and intelligible; tho', few of them are new, yet moſt of them are neglected in the common books of anatomy, and no author of my acquaintance has collected them.

That the truth of theſe facts may be more unqueſtionable, I ſhall either point out the manner in which others may obſerve them; or, where I had not the opportunity of an exact enough examination myſelf, I ſhall quote my vouchers, who are authors of the beſt characters for knowledge and candour: And if I affirm at any time the being or ſtructure of things that are not demonſtrable to the ſight, I ſhall ſet down other facts from which they ſeem to be plainly and neceſſarily concluded to be true. But, becauſe my deſign confines me from entering into very particular minute deſcriptions, I generally refer to books where ſuch deſcriptions are to be had, ſo that thoſe who deſire to be more fully inſtructed may know where to be informed; and others, who do not incline to give themſelves any further trouble, may believe as well as they pleaſe of my honeſty, and will meet with no great interruption in reading by the ſmall mark of a reference to the quotations.

The Preliminary Facts.

1. THE human uterus has numerous orifices of veſſels opening into its cavities to pour out liquors there [*].

Theſe liquors may at any time be ſeen oozing out, by gently preſſing the ſubſtance of an opened uterus.

2. TOWARDS the fundus of the womb eſpecially, theſe orifices are found to be the extremities of canals that come out from larger cavities lodged within the ſubſtance of the womb; theſe cavities are commonly called ſinuſes [†].

3. THE ſinuſes are much of the ſame texture with the cells of the ſpleen, or rather of the *corpora cavernoſa penis*, being membranous cavities communicating with each other, and having numerous arteries ſpread on them, whoſe lateral branches open into the cells, from which veins go out, to be joined to other veins that return the blood from the other parts of the womb [‡].

4. Theſe ſinuſes are diſtended with blood in the time of the menſes, when their orifices alſo are enlarged [||].

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[*] Tho. Bartholin. anat. reform. lib. i. cap. 28. Santorin. obſerv. anat. cap. xi. § 11.

[†] Bartholin. anat. reform. lib. i. cap. 28. Morgagn. adverſ. anat. iv. animad 26. 27.

[‡] Malpigh in epiſt. ad Spon. Lettre in memoires de l'Acad. des Sciences, 1701.

[||] Bartholin. anat. ref. lib. i. cap. 28. Morgagn. adverſ. anat. i. § 33. adv. iv. § 27.

I have ſeen this in ſeveral women I diſſected.

5. During the time of pregnancy, the ſinuſes and their canals that open into the womb are gradually diſtended and enlarged.

In a woman who died three or four months gone with child, I ſaw the orifices of theſe canals large enough to receive a gooſe-quill, the ſinuſes being conſiderably larger. At the end of nine months the ſinuſes can contain the point of the largeſt finger [*], and the canals from them can receive the little finger [†]. This I ſaw in two wombs.

6. Besides the reticular bundles of muſcular fibres, which enter into the ſtructure of the womb [‡], I have twice ſeen, where the placenta adhered, what agreed exactly with Ruyſch's deſcription and picture of what he calls the orbicular muſcle [‖]; but, having miſſed it in four other fit ſubjects, and conſidering the thickneſs, ſoftneſs, and ſucculency of the villous and internal cellular coats covering the inner ſide of the muſcular fibres of the womb, I ſuſpected that I had two much faith in Ruyſch, and therefore too haſtily, without ſufficient examination, concluded what had an orbicular appearance on the internal ſurface of the womb of the firſt two ſubjects to be muſcular; I now rather believe it to be only a print made by the placenta upon the ſoft ſurface of the womb.

7. The

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[*] Santorin. obſer. anat. cap. 11. § 9. Morgagn. adv. anat. iv. § 29.

[†] Morgagn ibid.

[‡] Malpigh. in epiſt. ad Spon.

[‖] Ruyſch epiſt. de muſc. in fundo uteri,

7. The placenta generally adheres to, or near to the fundus of the womb.

All agree in this. In five women with child, whom I had occaſion to open, the placenta adhered to the interior part of the fundus.

8 The placenta is covered on the ſide next to the womb, with a fine membranous continuation of the chorion [*].

I ſaw this diſtinctly in the five ſubjects I diſſected.

9. The extremities of the umbilical veſſels pierce this membrane, and ſhew their very ſmall orifices on its ſide next to the tuterus; and therefore it is compared to the villous coat of the inteſtines [†].

The orifices of theſe veſſels of the villous ſurface of the placenta are ſo ſmall, that even lukewarm water, injected by the umbilical arteries, or by the vein of a placenta which had this membrane entire, when puſhed with all the force that I could apply to the ſyringe, only ouzed out at a number of ſuch ſmall orifices as I could not perceive, and it came out ſo ſlowly that I was unable to continue puſhing the ſyringe till I could make eight ounces of the water paſs through them. When oil of turpentine with the fineſt powder of vermilion was injected, the oil ouzed out, but brought none of the powder with it, though the oil which returned into the umbilical vein, when the injection was thrown in by the arteries, was coloured with the vermilion.

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[*] Ruyſch. theſ. anat. xi. aſſer. iv. n. 18. not. 1. & theſ. v. n. 41. Santorin. obſerv. anat. cap. 11. § 11.

[†] Ruyſch. theſ. v. n. 41. Rouhault memoires de l'Acad. des Sciences, 1714 & 1716.

10. The allantois was carefully ſought for in all the five ſubjects I opened; but we could ſee no ſuch cavity, or liquor in it. The membranes had a looſe connexion, by a cellular ſubſtance, and a fine tranſparent membrane was obſerved between the chorion and amnios.

11. The uteri of other animals have veſſels opening into their cavities, as well as the human womb, and the ſame trial diſcovers them; and, during gravidation, the internal membrane becomes villous, and has a thick ſucculent cellular ſubſtance interpoſed between it and the muſcular coat.

12. The membranous continuation of the chorion is not ſo evident on the exterior ſurface of the placentæ of brutes, as in the human ſubject; but their ſecundines have numerous orifices of the umbilical veſſels opening on their ſurface next to the uterus, as is evidently demonſtrated, by injecting a thin liquor into the umbilical vein or arteries; for it ſoon comes running out every where from the exterior ſurface of the placenta and chorion, carrying the powder of vermilion or verdigreaſe along with it; which ſhews the extremities of the veſſels to be larger here than in the villous membrane of the human placenta; § 9.

13. The mother ſupplies liquors to the fœtus, which returns others to the mother by means of the uterine and umbilical veſſels.

This ſeems to be plainly proved by obſervations. Fœtuſes, whoſe placentæ were not in the leaſt ſeparated from the uterus, have been

quite

quite exhauſted of blood by the mother's dying of an hæmorrhage [*]. And I have ſeen children pale and weak, by violent flooding in the time of labour.

14. When a fœtus dies, or is ſeparated from its ſecundines by cutting the umbilical rope, the circulation of liquors is wholly ſtopped in the veſſels of the ſecundines, and theſe become a lifeleſs maſs.

The experience of our greateſt practiſers in midwifery ſufficiently proves this. They tell us that no hæmorrhage or diſcharge of any other liquor happens at the umbilical veſſels, upon the navel-ſtring's being cut or broke, after the veſſels are ſecured on the ſide of the child, as I have alſo ſeen frequently; and another proof is the placentæ commonly ſeparating in a ſhrivelled or ſuppurated ſtate, ſoon after the communication with the child is deſtroyed [†].

When one is to obſerve whether the umbilical veſſels have a circulation of blood kept up in them, after their communication with the child is ſtopped or deſtroyed, he needs ſcarce be deſired not to miſtake a few drops of blood, ſuch as would come from an amputated limb of a dead perſon, for an hæmorrhage; but he ought to obſerve one caution, which is, to make ſure before the trial, that there is no fœtus left with its navel-ſtring untied or uncut: For, in the caſe of twins, when often the placentæ are blended, and ſometimes one navel-ſtring ſerves both *; though one child is taken away, the other may fill the veſſels of the placentæ, and continue their functions; ſo that an hæmorrhage would happen at the cut, but untied, navel-ſtring of the firſt child. We have an inſtance of a mother and child being almoſt wholly drained of their blood, by the midwiſe's neglecting to tie the navel-ſtring of the firſt of the twins, which was brought forth without perceiving that the other ſtill remained in the womb †. This caſe ought to be added to the hiſtories brought in proof of § 13.

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[*] Mery dans l'hiſt. de l'Acad. des ſciences, 1708. Heiſter, compend. anat. not. 36.

[†] Mauriceau maladies des femmes groſſes, liv. 2. chap. 7. Ruyſch. in theſ. obſerv & adverſ.

15. THAT power which phyſicians generally now-a-days call abſorption, whereby the ſmall open orifices of veſſels imbibe liquors lodged in the cavities of the body, is obſerved to increaſe or diminiſh proportionally to the ſtrength or weakneſs of the creature.

In diſeaſes where the contraction of the veſſels is too great, as in moſt of thoſe that are called acute, there is ſcarce as much moiſture in the cavities or interſtices of the parts, as allows them to ſlide eaſily one upon another. In health, the quantity of ſuch liquors is moderate, and a pretty conſtant equality is kept between the action of the exhalants and of the abſorbents. But, when the body turns weak, the exhalants pour out ſo much more than the abſorbents can take in, that all the cavities are found to contain conſiderable quantities of liquors. After death, the action of the abſorbents ſeldom or never can be ſupplied by any mechanical

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* Mem. de l'Acad. des ſciences, 1720. Act. medic. Berol. Dec 6. vol. 4. § 4.

† Hiſtoire de l'Acad. des ſciences, 1727.

mechanical preſſure. For examples of what has been ſaid concerning abſorption, conſider the common phænomena which are to be obſerved in the long alimentary tube, in the large cavities of the abdomen, thorax, pericardium, &c. and in the ſmaller cavities of the tunica cellularis every where, of the cornea, &c. both in a ſound and morbid ſtate.

Hence we may underſtand how purgatives or diuretics may ſerve to drain off extravaſated hydropic waters, by ſtimulating the veſſels to a ſtronger abſorption, and how corroborants may produce the like effect, though more ſlowly.

16. THE liquors § 13. are not carried from the mother to the fœtus, or from the fœtus to the mother, by continued canals; that is, the uterine arteries and veins do not anaſtomoſe with the veins and arteries of the ſecundines*; but the extremities of the umbilical vein take up the liquors by abſorption in the ſame way as the lacteal veſſels do in the guts; and the umbilical arteries pour their liquors into the large cavities of the ſinuſes or other cavities analogous to them.

Were I allowed to illuſtrate the communication between a mother and her child in the womb, by a groſs compariſon, I would ſay that the uterine ſinuſes are to a fœtus what the inteſtines are to an adult. The uterine blood poured into the ſinuſes being analogous to the recent ingeſta of food and drink: The liquors ſent from the umbilical

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[*] Harvey de generat animal. exercit. 70. Ruyſch. theſ. V. n. 41.

bilical arteries to be mixed with the uterine blood, reſemble the bile, pancreatic juice, and the other liquors ſeparated from the maſs of blood: The umbilical veins, and thoſe on the ſurface of the chorion, take up the finer part of this compound maſs, as the lacteal and meſeraic veins do from the contents of the guts. And the groſſer parts of the blood in the ſinuſes are carried back by the veins of the womb, as the excrements of the guts are diſcharged at the anus.

It is plain, from the diſproportionate ſize of the human ſinuſes, and of their excretory canals, to the very ſmall extreme umbilical veſſels, (compare § 5. and 9.), that there can be no anaſtomoſis by continued canals ſuppoſed here; which alſo ſeems to be proved next to a demonſtration by § 14.; for if the veſſels of the ſecundines anaſtomoſed, an hæmorrhage or flux of ſome liquors would happen at the umbilical vein, whenever the navel-ſtring was broke or cut, and would continue as long as the afterburden adhered to the uterus; and, if the umbilical veſſels were tied, the circulation would ſtill continue in the placenta, and it would not become a lifeleſs maſs: But the reverſe of all theſe are obſerved, which makes a moſt ſure proof of the communication of the placenta with the uterus being deſtroyed as ſoon as the navel-ſtring is divided; and as § 14. ſhews the ſecundines to owe their life and action to the fœtus, ſo the reaſon of their taking in no fluids, after it is ſeparated, is evident from § 15.

In brutes, we can obſerve no tearing or breaking of veſſels, when we ſeparate the placentæ from their uteri; and when any liquor is injected into their uterine arteries, none of it does paſs into the umbilical veſſels, as I have many times fully tried in the glanduliferous animals, cows, ſheep, &c. and in ſome others. In many animals the ſecundines and uterus do not adhere for a conſiderable time *; and in ſome of theſe, mares for inſtance, in whoſe ſecundines the allantois is every where interpoſed between the chorion and amnios †, there is no way for any nouriſhment to be conveyed to the fœtus, except by the veſſels of the ſecundines, which therefore can only take up their liquors by abſorption; and why may not the ſame obtain in other animals?

'Tis worth while to remark by the way the inconveniencies that are ſhunned by the want of an anaſtomoſis between the veſſels of the womb and ſecundines. The violence of the mother's circulating fluids is not in hazard of deſtroying the embryo, while tender; and there are no veſſels to be broken or torn at birth, which would have required too much force in bringing away the placenta, and would have brought on inflammation, ſuppuration, and other bad ſymptoms.

Some gentlemen, who contend for an anaſtomoſis, are ſo ſenſible of theſe inconveniencies, that, to ſhun having them objected to them, they will not allow the anaſtomoſing canals to be

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* Fabric ab Aquapend. de form. fœt. part. 1. cap. 3. Needham obſ. anat. cap. 2.

† Needham. ibid & cap. 3.

be of one continued ſubſtance, but ſuppoſe the veſſels of the uterus and ſecundines to be joined only *per appoſitionem*, which they explain to be, by the one ſort receiving the other ſome way within them, in the ſame manner as the ſecond ſort of pipes receive the firſt in the injecting inſtruments *; ſo that, the coats of the veſſels being thus contiguous, they may ſerve for the tranſmiſſion of liquors, as well as if they were of the ſame continued ſubſtance, and may be ſeparated with a ſmall force, and without any laceration.

This ſuppoſition takes off indeed the objection of ſuch inconveniencies, but is itſelf equally deſtroyed with the former, by the other arguments uſed againſt the anaſtomoſis or propulſion of liquors from the mother into the branches of the umbilical vein, and, at the ſame time, expoſes the propoſers of it to ſtill greater difficulties. They muſt ſhew that the ſizes of the oppoſite veſſels are fitted for ſuch an intusſuſceptio; whereas the diſproportions of the human are moſt conſpicuous; and, in other creatures, the chances of unfitneſs are much greater than thoſe of their being rightly adapted to each other. They muſt name ſome other inſtance of any thing like this being obſerved any where elſe in a ſound creature. If they take a morbid caſe, ſuch as the cure of wounds by ſymphyſis, to illuſtrate their doctrine by, they would do well to conſider how ſoon the change from contiguous to continued veſſels is made there.

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* See Art. 9. of the firſt vol.

Were it not to prevent any good grounds for a reply, I would leave the doctrine I have advanced to be maintained by the arguments already uſed; but I know there are ſome particular obſervations or experiments which may be inſiſted on as clear evidence againſt me, if I do not take off their force; and therefore allow me to ſtate ſuch objections with their anſwers.

Mr Mery [*] deſcribes a child that had no heart, lungs, &c. nor nothing analogous to a heart; and therefore cannot conceive any other force that could continue the circulation of the blood in this monſter than the motion it acquired from the uterine arteries, which, according to him, muſt have inoſculated with the placentary veſſels, that the liquors might be propelled through theſe.

Mr Mery has deſtroyed the neceſſity of his own ſuppoſition in the relation of the fact; for he tells us, That this monſter was twin to a perfect child, whoſe *funis umbilicalis* ſent off the ſmall navel-ſtring of the monſter; and therefore the heart of the compleat child would drive forwards the blood of the monſter, at the ſame time that it promoted its own circulation, without any neceſſity of aſſiſtance from the mother's blood.

Mr Cowper is ſometimes quoted alſo for ſupporting the contrary of what I have aſſerted: His words are [†]: “ Theſe blood-veſſels of the “ uterus are inoſculated with thoſe of the placenta,

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[*] Mem. de l'Acad. des ſciences, 1720.

[†] Anatomy of human bodies, explic. of tab. 54. F. F. F.

"as may appear by the paſſing of mercury from
"one to the other; ſo that, if you pour it into the
"hypogaſtric arteries of the mother, it will
"paſs into the veins of the placenta, as well as
"thoſe of the uterus· And, on the contrary,
"from the arteries of the placenta to the hypo-
"gaſtric veins of the mother; as alſo into
"the veins of the placenta. Hence it ap-
"pears there is a circulation of blood between
"the mother and fœtus; and it ſeems as if the
"blood-veſſels of both did germinate and inoſ-
"culate with each other. But this requires too
"much ſpeculation for my occaſions to admit of
"a further inquiry at preſent."

I imagine that every one who reads the preceeding paragraph, eſpecially if he is at all acquainted with Mr Cowper's manner of telling what he has ſeen, will readily judge, that this author is there aſſerting rather *a priori* what he thinks would happen, than deſcribing what he really ſaw upon trial. Obſerve only how dubious and timorous his words are: "The inoſ-"culation may appear by pouring in mercu-"ry ——It ſeems as if the blood-veſſels of "both did germinate and inoſculate. ——This "requires too much ſpeculation to admit of a "further inquiry at preſent." If he had made the experiment, he would have told us that he had poured in mercury, and, after ſeeing it paſs in ſuch a manner, was certain ſuch inoſculation did obtain.

Drake, who wrote after the publication of Cowper's Anatomy of human bodies, ſhews plainly, that Cowper never made this experiment in the human ſubject; for, after deſcribing a preparation which, he ſays, “ Mr Cowper kept “ by him, of a cotyledon, and part of the uterus of a cow, in which mercury, poured into a branch of the uterine artery, went into one “ of the cotyledons of the uterus, and filled “ thoſe branches of the umbilical veins which “ went from that cotyledon to the navel “ of the fœtus, he adds, It would be a weak “ objection to alledge, that the obſervation and “ experiment being made on the uterus of a “ cow, the inference would not hold from “ thence to a woman.” And he is obliged to make uſe of the flux of blood which conſtantly follows upon drawing the placenta from women, to prove the continuity of the veſſels of the human womb and ſecundines. Had Cowper ever made mercury paſs from the uterine into the umbilical veſſels in the human ſubject, it would certainly have been told here by Drake, who was greatly aſſiſted by Cowper in at leaſt the anatomical part of his book.

Since the two former editions of theſe eſſays, Dr Nortwyk has publiſhed an accurate deſcription of an impregnated human womb, and of its contents, to which he has added an account of what authors have wrote on the different parts which he examined *. In this treatiſe Dr Nortwyk affirms, that the matter which he injected by the uterine arteries paſſed into the veſſels of the chorion and placenta, which he is ready

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* Uteri humani gravid. anatom. & hiſtoria, autore Willielmo Nortwyk, M. D. 4to, Lugd. Batav. 1743.

ready to demonſtrate at any time in the preparation which he preſerves.

Such a poſitive aſſertion of an anaſtomoſis, or of a continuity of the veſſels of the womb and ſecundines, by a gentleman of ſo much learning and candour as Dr Nortwyk evidently appears to be, has made ſeveral conſiderable men to decide againſt me, and to affirm upon his authority, that there is an anaſtomoſis. But, upon comparing his deſcription with my diſſections of big-bellied women, I think it altogether evident that a miſtake of the doctor in the diſſection has led him into concluſions directly contrary to what I am perſuaded he will make when the miſtake is pointed out to him. That every one may judge for himſelf, I ſhall here firſt ſet down his deſcriptions of theſe parts; then I ſhall mention what I remarked in my diſſections; and, laſtly, I ſhall point out the circumſtances in both, from which the concluſion muſt be drawn.

" Dr Nortwyk was ſurpriſed that he could " not recline over the cut parts of the womb. " Inquiring into the cauſe, he ſaw the chorion " grown to the womb by a true but very ſoft " cellular ſubſtance, by means of which the " whole ſurface of the ovum adhered moſt " ſtrongly to the womb, ſo that no mark of di- " viſion appeared when the ſubſtance of the " womb was raiſed. Having ſoftly depreſſed " the ovum with the back of a knife, and mo- " ved the knife backwards and forwards (recipro- " cato) betwixt the ovum and uterus, that

“ connecting ſubſtance was moſt eaſily broken[*].

“ Numerous injected veſſels with very thin coats were ſeen in this cellular ſubſtance ſtretched from the chorion into the womb, which he calls veſſels of the two parts joined by anaſtomoſis, and believes them to be veins[†].

“ The larger branches of theſe veſſels were remarkably dilated within the ſubſtance of the chorion into twice their former capacity, forming ſinuſes, and in this form were extended an inch, then dividing into branches ſank deeper into the chorion[‡].

“ At the placenta the cellular ſubſtance was ſtronger, and the connexion greater with veſſels likewiſe extended thro' it[§].

“ At the root of the placenta, there were numerous very large veſſels capable of admitting a child's finger; they were true venous ſinuſes made of very thin coats and ſhort, from which branches much ſmaller, moſtly very ſmall, ſunk into the placenta, and in ſome places penetrated to its baſis, where it lies on the chorion[‖].

“ There were no veſſels in the womb of equal ſize and correſponding to theſe ſinuſes; which ſurpriſed him, having ſeen veſſels of a womb of a new laid woman diſſected by Profeſſor Albinus, and of one diſſected former-

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[*] Uteri anat- § 6. No. 1.

[†] Ibid. No. 2

[‡] Ibid. No. 3.

[§] § 7. No. 1.

[‖] Ibid. No. 2.

“ly by himſelf ſo large, that an adult perſon might almoſt have put his finger into them *.

“ The whole internal ſurface of the womb had many orifices of veſſels filled with the injection †.

“ The ſurface of the ovum was all ſhaggy, becauſe of the remains of the cellular ſubſtance ‡.

“ The chorion was opaque, ſoft, fungous, and ſo very tender as to be eaſily torn ‖.

“ Under this fungous there was a reticulated ſubſtance **.

“ The fungous and reticulated ſubſtances ſeparated moſt eaſily from each other ††.

“ Placentæ extracted after child-birth, when injected, ended in pulpy knots, which macerated ſhewed themſelves to conſiſt of very ſmall veſſels of the pencil-form +.

“ The injection into the impregnated womb did not penetrate into the fœtus or umbilical rope ++.

“ On the ſide of the placenta fartheſt from the womb, the red colour of the injection ſhined through the chorion, and, in one part where the chorion was taken away, the ſmall

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* Ibid. No. 3.

† § 9. No. 1.

‡ § 11.

‖ § 12. No 1.

** Ibid. No 2.

†† Ibid. No. 3.

+ § 28 No. 2.

++ Hiſtor uter. pars 2. § 83.

" injected veſſels were to be ſeen in the pre-
" paration *.

Thus far Dr Nortwyk gives an account of his diſſection, &c.

I have now diſſected five women who died each with a child in the womb, before either the membranous part of the ſecundines was torn to let out the water, or that the placenta was the leaſt ſeparated from the womb. One of them was ſaid by the friends to have been between three and four months gone with child, three others were about ſix or ſeven months, and the fifth was paſt eight months with child. I likewiſe examined the body of a ſixth woman, whoſe child in the labour had torn the *os uteri*, and by the aperture had eſcaped into the cavity of the abdomen, dragging its ſecundines along with it. In all of them I found a thick fungous ſucculent cellular ſubſtance between the muſcular part of the womb and its villous coat, through which numerous thin-coated veſſels paſſed, and in this cellular ſubſtance the ſinuſes were. Excepting its ſinuſes, it reſembled the internal cellular coat of the inteſtines.—I was ignorant of this ſtructure, when I began the diſſection of the firſt big-bellied woman; and therefore, when I had cut through the firm muſcular part of the womb, and ſaw this fungous ſubſtance, I imagined it to be the placenta. I was ſurpriſed to find the coheſion of this ſuppoſed placenta to the womb ſo firm, but perſiſted to ſeparate the muſcular part of the womb from it, till, having torn a little of the fungous ſubſtance,

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* Ibid.

I obſerved the ſmooth tenſe Chorion, from which the fungous ſubſtance ſeparated moſt eaſily, as it did likewiſe from the placenta, by only gently preſſing the ovum with one hand and raiſing the womb with the other, without the aſſiſtance of any other inſtrument. What of the fungous ſubſtance had been left at firſt with the ovum came off as eaſily.—I avoided this miſtake in diſſecting the other four impregnated uteri which I had occaſion to examine afterwards, and then had the villous coat of the womb entire, and the ſmooth chorion ſpread over all the ſecundines.

Let the following circumſtances be conſidered.

1. The firm adheſion of the uterus to the ovum as deſcribed by Dr Nortwyk; whereas in natural births, and in my five ſubjects, the womb and ſecundines ſeparated moſt eaſily.

The want of ſinuſes, or of veſſels a-kin to them in the womb, which gave riſe to his treatiſe; whereas the ſinuſes were demonſtrated by Dr Albinus, and they were ſeen by Dr Nortwyk himſelf in the womb of a woman lately delivered, and they were found in all my ſix ſubjects.

The ſhaggy ſurface of the ovum, and the ſoft fungous opaque chorion deſcribed by the Doctor; whereas the chorion in natural births, and in all my ſubjects was ſmooth, firm, and tenſe.

The ſeparation of the fungous ſubſtance on the ſurface of the ovum mentioned in this treatiſe was as eaſy, as what I found the ſeparation of the womb from the ovum.

Large ſinuſes were found by Dr Nortwyk

in the placenta and chorion, which never were ſeen in theſe parts of any other ſubject.

From theſe circumſtances I muſt think, that the Doctor perſiſted in the error which I committed in diſſecting the firſt impregnated uterus, which I had occaſion to examine, and brought off the internal cellular ſubſtance, and ſinuſes of the womb with the ovum, in which caſe all the appearances would be preciſely as he has deſcribed them; and he will be under no neceſſity of imagining ſome particular form of veſſels here, or any extraordinary change of ſtructure made in placentæ by extracting them at birth; on the contrary, the reaſons of all the phænomena are obvious, and he has afforded me a very pretty proof of there being no anaſtomoſis between the veſſels of the uterus and ſecundines.

Leſt the laſt paragraph which I quoted from Dr Nortwyk ſhould make any incline to think, that, in his preparations, ſome of the placentary veſſels were injected, I muſt explain the appearances there mentioned, which I ſhall do by the aſſiſtance of the Doctor himſelf. "The "placenta, ſays he juſtly, (§ 15. 28.) conſiſts "of a great many knobs, between which the "membrane (the exterior lamella of the "chorion) is inſerted as the pia mater is be-"tween the convolutions of the brain, and "the ſoft ſpongy internal ſubſtance of the "womb is inſinuated into the furrows be-"tween theſe knobs." —— No wonder then, that the uterine veſſels filled with a coloured ſubſtance ſhine through the chorion on the other ſide of the placenta, or are ſeen when the chorion is taken away. Let us remember this when we read any where, that injections into the uterine veſſels *placentam ſubibant*.

To Dr Nortwyk's experiment in proof of liquors not going from the uterine veſſels into thoſe of the ſecundines, I ſhall add a trial which I made of injecting theſe parts of a woman three or four months gone with child. Having fixed a pipe into one of the iliac arteries, and having tied the other iliac artery, and the veins, I puſhed through the pipe fine oil of turpentine, which is a liquor that eaſily goes from the extreme arteries of any part of the body into the correſponding veins. I continued this injection till all the veſſels of the womb, both arteries and veins, were in hazard of burſting, and till all the gentlemen preſent agreed, that a ſufficient quantity and force were employed. Not one drop of this oil was found in any branch of the umbilical veſſels or in the fœtus, though it was ſearched for moſt carefully.

Dr Nortwyk is of opinion, that nothing can be concluded againſt the anaſtomoſis of the veſſels of the womb and ſecundines, from the experiment juſt now related: For, ſays he [*], " Injections do not always paſs where there " is a continuation of veſſels; thus, for ex" ample, Ruyſch [†] informs us, that though he " filled numerous branches of the ſpermatic " artery running in the interſtices of the ſemi" nal tubes, and alſo the ſmaller lateral

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[*] Hiſt. uteri gravid. pars 2. § 83.

[†] Theſ. anat. IV. No. 8.

"branches of arteries beſtowed on the tubes; "yet he never could make his injection enter "the tubes, notwithſtanding that De Graaf "† deſcribes theſe tubes as ten times larger "than the injected arteries."

If the ſeminal tubes were of the ſize deſcribed by De Graaf, where they begin at the extremities of the ſecerning arteries, and theſe extremities were no ſmaller than the arteries which Ruyſch injected, ſome application might be made of this example to the preſent caſe; but ſeeing the ſpermatic arteries may divide, for ought we know, into branches not one million part the ſize of thoſe which Ruyſch injected, before they became ſeminal tubes; there is no other inference to be drawn from this quotation from Ruyſch and De Graaf, than that the ſpermatic arteries divide into branches before they become ſeminal tubes, too ſmall for Ruyſch's injection to enter.——If the ſpermatic arteries had been as large at their extremities, as what were ſeen in the internal ſurface of the womb in Dr Nortwyk's preparation, and if the ſeminal tubes had been as large at their beginning, as what he calls placentary veſſels; I make no doubt that Ruyſch's injection would have filled the larger ſeminal tubes, *epidydimis*, *vas deferens*, &c. as Dr Nortwyk's injection ought to have filled the umbilical vein, and ſeveral of the veſſels of the foetus, had it once entered into ſuch large branches of that vein as he imagined.

Let us next examine the trials made on

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† De viror. organ. p 43.

brutes for proving the anaſtomoſis or continuity of the veſſels of the womb and ſecundines.

I have already tranſcribed Dr Drake's account of Mr Cowper's "having poured mer-
"cury into the uterine artery of a cow, that
"went into one of the cotyledons of the uterus,
"and filled thoſe branches of the umbilical
"veins which went from that cotyledon to the
"navel of the fœtus."

Mr Cowper * mentions ſome other preparations of the ſame parts in cows, but takes no notice of this one, and Drake expreſſes himſelf ſo little like an anatomiſt in comprehending both the glandula of the womb and the placenta of the ſecundines under the name of cotyledon, that I ſuſpected his having committed a miſtake here; and therefore I repeated the experiment many times, by pouring mercury ſometimes into a branch of the uterine arteries diſtributed to one of the glandulae, and at other times I poured the mercury into a branch of one of the umbilical arteries ſent to a placenta, but never could make one drop of it go from the veſſels of the one into the veſſels of the other. The weight of the mercury frequently makes the glandula and placenta ſeparate from each other, and then the foveae of the glandula and the interſtices of the papilla of the placenta have quick-ſilver lying in them; but none of it is to be ſeen in any thing like a veſſel of the placenta when it is poured into the artery of the womb, or of the glandula when it is poured into the umbilical artery.

Slade

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* Anatomy of human bodies, Explic. of tab.

Slade is quoted [*] for ſaying, "The placentulae of cows have more and larger veſſels than the cotyledons; and if a black liquor is injected into the artery which is ſent to a placentula, the cotyledon remains white. The liquor injected into the arterious veſſels of the uterus was carried to the cotyledons, and, by the cavities of the cotyledons, into the ſubſtance of the placentae." Theſe words being *carried into the ſubſtance of the placentæ*, may ſignify no more than effuſed on their unequal pappy ſubſtance. I have tried injections of very different kinds ſo often into the veſſels of the womb and ſecundines of cows, prepared in all the different ways I could contrive for making liquors paſs from the one to the other, without having once made a drop to paſs, that I cannot be more certain of any thing than that there is no anaſtomoſis or continuity of theſe veſſels in cows.

Vieuſſens is ſaid to have made the following experiment [†]: "He tied the left carotid artery of a living bitch with young, and then, having put a ſmall ivory funnel into the right carotid, he poured quick-ſilver at different times towards the head, till it amounted to about four pounds. By the time this quick-ſilver was poured in, the creature appeared to be quite dead, and he diſſected her before a great many witneſſes." After deſcribing the progreſs which the quick-ſilver had made in the veſſels of the bitch, he has theſe words: " Mirum dictu! Fluidum hocce " corpus, nullo rupto vaſe, et ne una quidem " gutta ſanguinis effuſa, placentam unumquemque " catulum obvolventem permeavit, et in ipſas " umbilicales venas protruſus fuit: Ipſummet " fluidum cavitates cordis, ſtomachi, veſicae felleae, " inteſtinorum, et veſicae urinariae, ingreſſus " eſt. Protruſus a me in arteriam carotidem " dextram mercurius, in arterias, et ſubinde in " ductus lactiferos mammarios, ſeſe immiſit, ut " ſupra indicavi."— No more of this deſcription relates to the foetus than " That fluid, (the mercury), " without breaking any veſſel, or the effuſion " of one drop of blood, paſſed through the " placentæ ſurrounding each whelp, and was " puſhed into the umbilical veſſels themſelves." All that follows about the heart, ſtomach, &c. being only applicable to the mother's organs, as appears by the reference to what he had ſaid above, where the parts of the mother only were mentioned, and by the account which he gives of this experiment in another treatiſe *, in theſe words: " Mercury being poured into " the right carotid artery of a bitch about " two months gone with whelp, the left carotid " being tied, paſſed into the umbilical vein " of the whelps without any breaking of the " veſſels."

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[*] Vid. Blaſ. anat. animal p. m. 122.

[†] Manget theat. anat. lib. 2. pars cap. 3. Excerpta e Raymundi Vieuſſenii epiſtol ad excell. Prof. celeb. Medic. Facult. Patav. et Bonon. in Genevenſi Verheyenii editione.

This experiment of Vieuſſens's is ſtrangely contrived; for, by tying one carotid artery, and putting a funnel into the other, he left the

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[*] Diſſertat. de ſtructura et uſu uteri et placentae muliebris, in Genevenſi Verheyenii editione.

the vertebral arteries alone to propel the blood and quick-ſilver through the veſſels of the head, from which they were to return to be diſtributed through the whole body.——Some of the blood of the vertebrals muſt have had a retrograde motion into the carotids by their anaſtomoſes, to hinder the entry of the quick-ſilver.——If the head of the bitch was placed ſo depending, as the weight of the mercury could overcome the reſiſtance of that blood, which probably has been done; then this ponderous liquor muſt have paſſed through the tender very ſmall arterious veſſels of the brain, and have aſcended in the veins contrary to its own gravity, to come to the heart; after which it muſt have performed the circulation through the heart and lungs to be ſent into the aorta, from which it behoved to be puſhed through the veſſels of the womb into the ſecundines.

I endeavoured to imitate Vieuſſens's experiment on a living bitch, but the creature died before any ſucceſs could be expected; and therefore, with the aſſiſtance of my colleague Dr Andrew Sinclair, P. M. and of Mr Gibſon, I took another way to try if the mercury would paſs from the womb into the umbilical veſſels. I cut as much of the teguments of the neck of a pregnant bitch immediately dead, as to have a view of as much of the carotid artery as I could open and put a pipe into, then hanged the bitch by the neck higher than where the pipe was, and, in this poſture, poured in the quick-ſilver, by which we prevented the mercury's running out at cut veſſels, and gave it the preſſure of a very high column to make it run further into the veſſels than it would have done otherwiſe. The quick-ſilver ſoon ran plentifully out at the vagina, the orifice of which was then tied, and more mercury was poured into the carotid, till all of us agreed, that, if there was any anaſtomoſis or continuity between the veſſels of the womb and ſecundines, the mercury muſt have paſſed from the one to the other. When we opened the bitch, we ſaw the veſſels of the uterus and of its cornua very turgid with quick-ſilver. The body of the uterus and the right cornu contained no fœtus, but were diſtended with extravaſated quick-ſilver. There was one whelp in the left cornu, which we tied above and below where the fœtus was lodged, then cut it out and laid it on a plate.——When this cornu was cut longitudinally, the annular placenta ſeparated moſt eaſily from it, and, as we were ſeparating them, the mercury ran plentifully out of the veſſels of the cornu, but not a drop of it appeared in, or dropped out of any veſſel on the exterior ſurface of the placenta or of the chorion.———After the amnios was opened, there was no mercury to be ſeen in the fœtus or in the umbilical veſſels, though we could trace theſe to their very minute branches in the placenta and membranes.—When the ſecundines had been handled ſome time, and the amnios was turned outermoſt, ſome exceeding ſmall and ſhort ſtreaks of quick-ſilver appeared under that membrane; but, not being contained within any thing like the coat of a veſſel, Dr Sinclair and I judged them to be no other than ſome drops of the mercury, which we had ſeen ſtick to the outer ſurface of the placenta, when they fell from the cornu, that had been preſſed by handling into the ſmall interſtices of the placentary ſubſtance; and therefore concluded that no mercury had paſſed from the uterus into the umbilical veſſels.——I repeated this experiment in a bitch that had five whelps in her cornua, without one drop of quick-ſilver being ſeen in any veſſel of any of their ſecundines, though both arteries and veins of the uterus and cornua were full of it. I deſignedly dropt ſome quick-ſilver on one of the placentae, and then worked it in with my fingers, till I formed ſuch ſtreaks as we had ſeen in the former trial, which I verily believe was all that Vieuſſens ſaw. Though, if we would grant, that ſome of the quick-ſilver in his experiment had entered the branches of the umbilical veſſels, or, even though the mercury had been found in the whelps, it would be no proof of the anaſtomoſis or continuity of the uterine and umbilical veſſels: For ſince, according to him, the bitch was alive, till, at different times, near four pounds of mercury were poured in, (*credat Judæus*), the placentary veſſels might have abſorbed the quickſilver.

Would a man, who believed that the above experiment ſhewed an anaſtomoſis, write in the following manner as Vieuſſens has done * ? " It is obſerved, that quick-ſilver injected in- " to the arteries of the womb, does not run " into its cavity, unleſs when its ſubſtance is

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* Diſſert. de ſtructur. et uſu uteri, &c. § 51.

“ ſtrongly preſſed with the fingers; for then
“ ſome parts of the mercury fall into the womb
“ by the pores of the lymphatico-arterious ca-
“ nals that form its ſubſtance.” And again *,
“ The effuſion of blood at birth, without
“ doubt, was alſo the cauſe why ſeveral old
“ anatomiſts, who were little acquainted with
“ the natural œconomy of the human body,
“ yea and Mr Mery, believed that the arte-
“ ries of the womb directly opened into the
“ veins of the placenta, and that the arteries
“ of the placenta opened into the veins of the
“ womb, from which they concluded, that
“ the mother's blood circulated into the body
“ of the fœtus, and that the blood of the fœ-
“ tus paſſed into the mother's body. But the
“ falſity of this opinion, which was refuted
“ by many anatomiſts of the laſt century, who
“ were not only ſkilful diſſectors, but very
“ learned natural philoſophers, ſhall be moſt
“ evidently demonſtrated from what I am to
“ ſay, when I explain the internal ſtructure
“ and the uſe of the placenta; ſo that the abet-
“ tors of it will readily reject it.

I have ſometimes ſeen quotations from Preſton † and Heiſter ‡, for experiments proving this diſputed anaſtomoſis; but there are no ſuch experiments mentioned in either of them. Preſton tells only that he ſaw, 1. Air paſs from the umbilical vein into the umbilical arteries. 2. Air and an injected liquor, forced into the hypogaſtric arteries of a woman new-

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* Ibid. § 56.

† Philoſ. Tranſact. Lowthorp's Abridg. Vol. 3. p. 210.

‡ Compend. anat. not. 36.

ly brought to bed, made their way into the cavity of her womb. 3. An injection into the umbilical vein of a fœtus which filled both its veins and arteries.----Heiſter has nothing but what I have already taken notice of.

Though I think this § 16. ſufficiently proved; yet, to ſhorten hereafter the diſpute concerning the nouriſhment of a fœtus, I may remark, that it will be ſufficient for my purpoſe in the preſent queſtion, to have part of the veſſels of the ſecundines granted to be abſorbents, (the negative of which, I dare affirm, no body will undertake to prove), though others were found to be continued, or to inoſculate with thoſe of the uterus.

17. The red particles of the blood are not probably abſorbed by the ſmall extremities of the umbilical vein.

My reaſons for thinking ſo are: The ſmallneſs of the orifices of theſe veſſels (§ 9.), the chylous appearance of what is ſeparated by the glandulæ of cows and ſheep, tho' the extremities of the veſſels of their placentæ are larger than in the human ſubject (§ 12.), and the want of an example of red globules being abſorbed any where elſe.

If it ſhould be aſked, Whence then has the fœtus red blood? I anſwer, without entering upon any philoſophical compariſon of the placenta in a fœtus, and of the lungs in reſpiring animals, that fœtuſes of viviparous animals have their red blood from the ſame ſource that chickens in ovo have theirs; which can be no other than the action of their heart and of the veſſels in their body and ſecundines.

If it ſhould be further objected, That the inſtances mentioned § 13. of children being exhauſted of blood by hæmorrhages from the mother's veſſels, ſhew the red globules to be ſent out from the ſecundines into the uterus; and therefore probably ſuch are taken in; the anſwer is ready, viz. That theſe inſtances prove the loſs of ſuch red particles no more, than the wan colour, faintneſs, and the emptineſs of the veſſels in a violent diarrhoea, are certain ſigns of bloody ſtools; which none will affirm they are.

18. The placenta does not increaſe in the ſame proportion which the fœtus does, for the ſmaller the fœtus is, the placenta is proportionally larger *

19. The ſmaller ſhare by far of the blood ſent out by the umbilical arteries is returned to the uterus, moſt of it being poured into the umbilical vein by anaſtomoſing canals.

This may be ſeen by injecting liquors into the umbilical arteries of any creature. Rouhault † calculates, that only one ſeventh part of the capillary branches of the human umbilical veſſels reach the exterior ſurface of the placenta.

20. The progreſſive motion communicated to liquors by the power of abſorption being ſlow, and no external alternate preſſure having a conſiderable effect in increaſing the momentum of the liquors moving in the veſſels contained within the uterus, it would appear that

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* See the figures in Ruyſch. theſaur. vi. Heiſter. fig. 27.

† Mem. de l'Acad des ſciences, 1715.

the blood returning to the fœtus is puſhed forward principally by the force of the heart and arteries of the fœtus itſelf.

That the force of the heart may be ſtrong enough to drive forward the blood in ſuch a long courſe as it muſt make in the ſecundines, the *canalis arterioſus* is ſent from the pulmonary artery into the deſcending aorta, whereby the blood thrown out by the umbilical arteries is propelled by the united force of both right and left ventricles of the heart, and theſe arteries anaſtomoſe with the branches of the umbilical vein by larger communicating canals than the arteries and veins commonly have in other parts of the body, as appears by injections: For liquors thrown into the umbilical arteries towards the placenta, require leſs force to make them return by the umbilical vein, and, when injected with the ſame force, they return more quickly, than they do into the vein correſponding to any other artery of a child when the artery is injected.

21. In the greater number of animals that have hitherto been carefully examined, the allantoid membrane with its contained urine has been found.†

22. The allantois of ſome animals (mares, bitches, cats,) ſurrounds the amnios, being every where interpoſed between it and the chorion. In others, (cows, ſheep, goats,) the allantois incloſes a conſiderable ſhare of the amnios. And in others (ſwine, rabbits,) it is confined to a ſmall ſpace ‡.

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† Needham. obſerv. anat. de form. fœt. cap. 3.
‡ Id. ibid.

23. At thoſe places where the allantois is not interpoſed between the other two membranes of the foetus, the chorion adheres to the amnios by a very fine cellular ſubſtance, which eaſily yields to any ſtretching force, as every one muſt ſee in examining the ſecundines.

24. The amnios has numerous ramifications of the umbilical veſſels ſpread upon it †, the orifices of the lateral branches of the arteries pouring out liquors into its cavity.

Injections plainly diſcover this; for, after injecting a thin liquor, water for example, into the umbilical arteries, dry the interior ſurface of the amnios well with a cloth; then preſs the membrane gently, or continue the injection, and the water is ſeen coming out on that ſurface, in the form that we ſee ſmall drops of perſpirable matter come out on the ſurface of the ſkin at the finger points, when we preſs the finger hard, or have tied a ſtring round it. I have many times repeated this experiment, and always with ſucceſs.

25. Seeing we can demonſtrate veins alſo on the amnios, and ſeeing the veins of all other membranous bags that have arterious canals throwing liquors into their cavity are endued with an abſorbing power, and take up fluids from the cavity, we may conclude that the veins here are the ſame way employed.

26. The liquor contained in the amnios is either wholly ſeparated from the veſſels of that membrane, or it is furniſhed partly from them, and in part from the foetus.

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† Id. ibid. Cowpar anat. of human bodies, expl. tab. 59. A. A.

In the creatures whoſe amnios is every where incloſed by the allantois (§ 22.) it is impoſſible this liquor can be tranſcolated from the uterus or its cavity, through all the membranes into the cavity of the amnios; becauſe, if the allantois could allow a paſſage to ſuch a fluid, its own contents would neceſſarily go along with it, which every one will confeſs would be of bad conſequence; but the truth is, that the allantois does not allow liquors to paſs through it. In thoſe creatures where the allantois only ſurrounds part of the amnios, if we did ſuppoſe the chorion and amnios, capable every where elſe of ſerving as ſtrainers, the liquor would always be found in conſiderable quantity in the cellular ſubſtance between them, (§. 23), which it is not; and what ſhould hinder it to run out as faſt as it could be conveyed in?

Let none here aſſume canals having orifices opening on the ſurface of the chorion, and ſent directly into the cavity of the amnios, unleſs he undertakes to demonſtrate them. There can be no ſuch canals in the creatures whoſe allantois ſurrounds their amnios; for there are no threads extended croſs the allantois.

Harvey's obſervation † of this *liquor amnii* being ſeen in a large quantity before the fœtus is formed, may probably be objected to me as a ſure argument of its being derived from ſome where elſe than the umbilical veſſels, or ſurface of the foetus; and that can only be from the cavity of the uterus by tranſcolation.

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† De generat. animal. exercit. 56.

Harvey's aſſertion is only this negative, that he did not ſee a foetus in the very ſmall conceptions he examined; but it is very evident, from later obſervations †, That the rudiments of the foetus, and its *funis umbilicalis* may be ſeen much ſooner, and while the conception is leſs than what he determines it to have been in the caſes where he ſays he could not ſee it; and, in my opinion, extra-uterine foetuſes prove clearly that the embryo is always lodged much ſooner in its ſecundines than we can diſcern the different parts of theſe; far leſs need we expect to be able to diſtinguiſh the different parts they contain. I ſhall readily allow that the *liquor amnii* is in larger proportional quantity, the younger a conception is: And, the reaſon of this appearance may very eaſily be underſtood, from what was ſaid concerning abſorption (§ 15.). From the obſervation itſelf, compared with what is above in this ſection, I would infer that the veſſels of the amnios furniſh by much the larger ſhare of the liquor contained in it.

Whoever conſiders the large placenta, § 18. the quick growth, § 32. and the weakneſs of a young foetus, will not affirm its being incapable of furniſhing this liquor of the amnios. ---The veſicles, full of water, in which there is no foetus, and conſequently no placenta, when found in the womb, cannot be eſteemed to be ova, but are hydatides, of which great numbers are often found here *; and therefore ſerve nothing for determining the preſent queſtion.

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† Compare Harvey's Exercit. 15. 16. 17. with Malpighius de ovo incubato, in the firſt three or four days of incubation, and his exercit. 56. with Kerkring. Anthropogr. Ichnogr. and Ruyſch. Theſ. 6. and many other later obſervations.

N. Authors having differed widely concerning the quantity and quality of the *liquor amnii*, and, my obſervations not having been univerſal enough to fix a general rule, I ſhall delay any inquiry into the ſtate of this liquor, till I come to examine it as it is employed in accounting for the nutrition of a foetus, where I ſhall conſider it, according to all the different opinions of authors.

27. As ſoon almoſt as we can obſerve any embryo, its umbilical veſſels diſcover themſelves †.

28. The mouth, lips and cheeks of foetuſes are at firſt wanting, and leave a large chaſm inſtead of a mouth, which is gradually contracted by the formation and conjunction of theſe parts, till it is brought to a due ſize ‡.

29. WHILE foetuſes continue in the womb, their muſcles are ordinarily left to act only by their natural contraction, or the foetus is ſaid to be in a ſleeping ſtate; but ſometimes, when its eaſe or preſervation requires a change of ſituation, it ſeems to perform ſome voluntary motions, which are called its *ſtirrings*.

The poſture of a child is owing to the muſcles being left to their natural contractions, the ſtronger one always prevailing, till their antagoniſts exert ſuch a reſiſtance by being ſtretched, as brings them to an aequilibrium; no wonder therefore that the ſpine is ſo much bowed forward, and the head is bended towards the knees: The thighs are brought forward; the legs are bended back; the arms hang down, but are drawn a little forward; the fore-arms, hands, and fingers are all bended, and thereby the hands are placed round the knees: For it will appear to any who ſhall take the trouble to conſider the ſtructure of theſe parts, that the members are all brought to that ſide where the muſcles have an advantage over their antagoniſts in number and ſtrength, or in the angles of inſertion, or in the length of the lever they act with.

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* Vid. Hiſtor. in Haller. not. m. in § 679. inſtitut. Boerhaavii.

† Harvey Exercit. 56. Ruyſch. theſ. 6. Riolan. Anthropograph. lib. 6. cap. ult.

‡ Harvey ibid.

That the poſture above deſcribed ariſes from the natural contraction of the muſcles, while the foetus is in a ſleeping ſtate, is farther evinced, by obſerving how much children ſleep after they are born, and how the members naturally go into near the ſame poſture when people fall aſleep.

30. THE ſtomachs of the youngeſt foetuſes we can diſſect are full of a mucous liquor, which remains of near the ſame conſiſtence all the time of geſtation, except that it becomes gradually ſomewhat more viſcous as the foetus increaſes.

This has obtained in all the different animals I have had occaſion to diſſect.

31. THE ſmall guts of foetuſes are full of a glairy mucaginous liquor, which becomes thicker

and darker coloured as it deſcends to the great guts, where it is collected under the name of *meconium.*

32. Foetuses increaſe proportionally leſs the longer they continue in the womb.

Mauriceau † pretends to determine the proportional increaſe of a child to be ſixty four times its own weight in triple the time. the numbers he condeſcends on are the following: At birth, a child weighs 12 pounds, of 16 ounces each; at three months, it weighs 3 ounces; at one month, three fourth parts of half a drachm; and at ten days, leſs than half a grain.

Having now eſtabliſhed the neceſſary facts, I deſign to uſe them hereafter as ſo many axioms or data; and, to ſave repetitions, I ſhall only refer to them by the numbers prefixed to each, in the ſolution of the ſeveral problems, to which I now return.

PROBLEM I.

How far the Mouth *or the* umbilical Veſſels *are neceſſary to the Nouriſhment of* Foetuſes.

AUTHORS have all known that foetuſes have been brought forth without mouths; but ſeveral of theſe monſters being found, upon a ſtrict examination, to have ſome other paſſage leading from the ſurface of their bodies into their ſtomachs, ſeveral writers of good account have affirmed, or, at leaſt, in an indirect

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† De maladies des femmes groſſes liv. i. chap. 5.

direct way have inſinuated, that ſuch vicarious paſſages are never wanting when the mouth is ſhut or deficient; which they think rather a ſtronger proof of the ordinary canal by the mouth in compleat foetuſes being altogether neceſſary for the nouriſhment of the foetus, than if no ſuch monſters had been ſeen; ſince, ſay they, we hereby ſee how careful nature is to preſerve a paſſage from without into the chylopoietic organs.

To remove all pretences for concluding hereafter ſo generally that a vicarious paſſage is never wanting, allow me to point out ſome authors, who give accurate and well vouched hiſtories of monſters who had no ſuch canals, and in ſome of which it was impoſſible they could have them, or they muſt have been altogether uſeleſs.

Children [*], a whelp [†], and a lamb [‡], were brought forth without heads, or any paſſage into the chylopoietic bowls. In other foetuſes that had heads, all paſſage to the ſtomach was ſhut up: See ſuch obſervations of children [‖], of whelps [††], of a lamb [‡‡], of a pig [‖‖]. Where the paſſage into the ſtomach has been open, there have been no inteſtines *. And, where the guts were, nothing could get down into them †.

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[*] Two by Littre, mem. de l'Acad. des ſciences, 1701; one by Mery, ibid 1720.

[†] De Graaf de mulier. organ. cap. 15.

[‡] Antoine hiſt. de l'Acad. des ſciences, 1703.

[‖] Littre mem. de l'Acad. des ſciences, 1701. Buchnerus act. med. phyſic. Acad. n. c. Vol. 2. Obſ. 96.

[††] Littre hiſt. de l'Acad. des ſciences, 1703. Brady Philoſ. Tranſ. n. 304.

[‡‡] Ruyſch. theſ. 4 n. 55.

[‖‖] Bellinger. de fœt. nutr. cap. 9.

Theſe examples are ſo exact in ſhewing the little neceſſity there is for either mouth or chylopoietic organs in the nouriſhment of foetuſes, that I need ſcarce mention how much they ſerve to determine the firſt part of this problem; and they make remarks on the hiſtories of foetuſes, who had the vicarious paſſages, unneceſſary; only allow me to caution the young phyſiologiſts, not to take ſome authors aſſertion, of the food being conveyed by thoſe extraordinary canals, for an eſtabliſhed truth, till they have examined what is to be ſaid for and againſt it.

Tho' the former part of the problem ſhould be determined in the manner I have argued for, which takes away all probability of nouriſhment being furniſhed to foetuſes by the mouth alone; yet the gentlemen who are of opinion that it is conveyed by both the umbilical vein and the mouth, endeavour to reſolve the latter part of it, ſo as ſtill to favour their ſentiments; for they undertake to prove that the ſupply by the navel may be wanting, as well as that by the mouth; and therefore that both contributing towards the nouriſhment in the natural ſtate of the foetus, whenever one of them is wanting, the other performs the function of both, as is ſometimes done in other parts of the body. I acknowledge great probability in this reaſoning, if they can bring a clear convincing

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* Lemery hiſt. de l'Acad. des ſciences, 1704.

† Calder, Medical Eſſays, Vol I. Art. 14.

cing proof of foetuſes ſubſiſting and increaſing without receiving liquors by their navel-ſtring. Seeing then this part of the problem is of ſuch importance in the preſent queſtion, I muſt be excuſed for inſiſting particularly on the ſeveral facts which I have obſerved to be advanced by authors in proof of the navel not being indiſpenſably neceſſary toward the nouriſhment of a foetus.

The firſt argument uſed by the gentlemen of the other ſide of the queſtion, is, That authors of the beſt character *, who have diſſected viviparous animals with young, aſſure us there is no adheſion or connexion between the ſecundines and uteri of moſt animals, for a conſiderable time after the conception is lodged there; and, in ſome animals, many months paſs before there is any adheſion †; therefore, ſay they, the foetus can receive nothing all this time from the mother by the umbilical veſſels, and conſequently is then wholly nouriſhed by the mouth.

On the ſuppoſition that the uterine veſſels muſt always inoſculate with thoſe of the ſecundines, before the umbilical veſſels can receive any liquors from the mother, this argument is indeed of great force; but, according to the ſcheme which I have explained, and, I hope, have proved in § 16.---17. of preliminary facts, it is a matter of indifference, whether the liquors furniſhed by the mother are applied to the bibulous orifices of the abſorbent

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* Harvey, Needham, De Graaf.

† Needham, obſ. anat. de form foet. cap. 2.

ent veſſels of the ſecundines, while the liquors are contained within cells formed in the ſubſtance of the uterus (§ 2.---5.), or when they are poured into the cavity of the uterus itſelf; for thoſe veſſels will equally well perform their office in both caſes, and thereby ſerve to nouriſh the foetus ſufficiently; which muſt take off the neceſſity we were here imagined under, of ſuppoſing the food to be wholly received at the mouth. Nay, in ſome animals, for example mares, whoſe allantois ſurrounds the amnios (§ 22.) and whoſe ſecundines have no connexion for a conſiderable time with the uterus, what has been juſt now ſaid is finely illuſtrated, and there is downright demonſtration of all the foetuſes nouriſhment being conveyed by the umbilical veſſels, as was remarked § 16.

NEXT, ſeveral obſervations are brought to ſhew, that the paſſage of liquors by the navel has often been ſtopped long before birth; the firſt I ſhall mention is one of Mr Petit: "Mr. "Petit (ſays the Secretary of the Academy of "Sciences †) cauſed the navel-ſtring of a human foetus to be ſhewn, which had a knot "in its middle, where one could obſerve the "marks of the contiguity *(d'attouchement)* of "the parts that formed the knot; which proves "that the knot had been made long before the "woman's delivery."

It may be ſaid, that this is in ſome meaſure anſwered by what Mauriceau ‡, Deventer ‖, and

† Hiſt. de l'Acad des ſciences, 1718.

‡ Maladies des femmes groſſes, liv. ii. chap. 26.

‖ Ars obſtetric. cap 38.

and other practical writers in midwifery affirm of the danger children are in of loſing their lives, when the umbilical rope is preſſed or expoſed to the cold air before birth; and by obſervations of foetuſes being killed by knots on the navel-ſtring †: But the fact, as it is told, is open to ſtrong objections; for there is not one circumſtance mentioned by which we can know whether this knot ſtopped the courſe of the blood, or if it was any more than one of the common ones, about which ſome midwives make ſo much to do. I have ſent you a figure of one, ſerving to ſhew you, by my injection paſſing, that liquors will not ſtop in ſuch. (See Tab. I. Fig. 5. 'repreſenting a piece of the funis umbilicalis, whoſe veſſels are diſtended with wax.' AA is the large vein; BB the two arteries twiſting ſpirally round the vein; C a very remarkable convolution of the arteries, which reſembled a knot, before the injection was thrown in.---- Further, I ſee no reaſon to conclude from Mr Petit's obſervations, as the ſecretary has done, that, becauſe there were marks of the parts which compoſed the knot, touching or being contiguous to each other, therefore the knot muſt have been of an old ſtanding.---Add to all this, that there is no mention made of the child's condition, whether it was born dead or alive. So that, from the whole, I muſt think there can be no uſe made of this obſervation in this argument; and I muſt alſo acknowledge,

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† Ruyſch. obſerv. xi. Gutterman. in commerc. Norimberg. 1731. ſemeſt. 1. ſpec. 20.

ledge, that the obſervations of children ſaid to be killed by knots on the navel-ſtring, are as little to my purpoſe; for though the authors who relate them do aver the knots to have been the cauſe of death, yet they do not mention circumſtances in the fact, ſufficient to ſupport their opinion, for which I muſt decline the greateſt authority, though it was ever ſo favourable to my ſide of the queſtion.

The ſecond obſervation brought to prove the courſe of the blood interrupted in the umbilical veſſels before birth, is what Mr Heiſter † quotes from Fred. Hoffman's Diſſertation *de pinguedine*. Unluckily that treatiſe is not among the collection of Hoffman's Diſſertations I am poſſeſſed of; and therefore I muſt take the relation of the fact at ſecond-hand: It is this: "A perfect child was born, whoſe "umbilical rope was all corrupt and putrid, "(*putedine totus corruptus erat.*") Mr Heiſter adds, "It would have been impoſſible that "it ſhould have lived, unleſs it had taken its "nouriſhment ſome other how than by the "navel."

Though, for ought that is expreſſed here by either Hoffman or Heiſter, it ſeems to be ambiguous, whether this compleat child was born dead or alive, yet I ſhall ſuppoſe the latter caſe; and, when this is granted, the account is ſuch as one cannot pretend to gueſs from it how long this navel-ſtring had been corrupted; what parts had been deſtroyed by the putrefaction; whether the cellular membrane and mucus of the rope only were affected; or if the veſſels involved in them were alſo deſtroyed. In ſhort, this ſtory does not ſeem diſtinct enough to allow any conſequence to be drawn from it. Leſt, however, any ſhould build on a ſtrict ſenſe of the word TOTUS, which ALL the world knows is generally uſed in a very vague way, let ſuch reconcile any appearance of a *funis umbilicalis* with the total and compleat corruption of the membranes, mucus, and veſſels compoſing it.

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† Compend. anat. not. 37.

The two following hiſtories are much more exact and to the purpoſe: One is from Chatton *, the other is told by Petrus Rommelius †. Both agree almoſt exactly in the principal circumſtances. Healthy children are born with the navel ſkinned over. The ſecundines, when afterwards brought away, are of a natural ſize, and the extremities of the umbilic rope are coaleſced. The mother of the one told Mr Chatton, that ſhe had gone with child three weeks longer than her ordinary time; and he thinks the navel was as ſound as a child three weeks old uſed to have it. Rommelius judges the other child's navel to have been as ſound as in children ſeveral months old. A ſmall little impervious proceſs about the ſize of a worm ſtood out from the navel, and the umbilical rope was as ſmall as a gooſe-quill.

Theſe authors have been very fond of ſetting the world a-ſtaring, otherwiſe they would never

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* Vander Wiel obſerv. cent poſt. pars 1. not. in obſ. 32.

† Ephemerid, German, dec. 2, a 7. obſ. 209.

never have made the compariſons of the ſoundneſs of the navels of the children in their hiſtories with thoſe of children ſo many weeks or months old. I wiſh they would explain to me what is the difference as to ſoundneſs in a ſound navel of children three days, weeks, months or years old. Since there is none, we are to inquire how long time theſe navels had probably been in ſkinning over after the navel-ſtring was broke or eroded. The circumſtance of the ſecundines being of a natural ſize, ſhews that this accident did not happen long before birth; for from what was ſaid in § 14. of the placenta being a lifeleſs maſs after the communication betwixt it and the child is deſtroyed; and from what the beſt and moſt experienced practiſers in midwifery † agree in the ſize and ſtate of the after-burden muſt be greatly changed in very little time after it is in that lifeleſs ſtate which muſt be here ſuppoſed. The only way of judging in what time a ſkin might be brought on the navel of the children mentioned in the foregoing hiſtories, is, to determine how ſoon after birth children's navels are ſkinned over; and then to inquire, whether a cicatrice would be ſooner or later brought on by the child's continuing immerſed in its waters after the navel-ſtring was broke. I have frequently ſeen, and among the reſt in my own children, the tied piece of the navel-ſtring fall off, in four, three, or two days after birth, and the ſkin was found ſound where the ſhrivelled ſtring ſeparated: And you probably know how very ſoon the remains of the navel-ſtring drop off from brutes. If then ſuch a ſeparation can be made ſo ſoon, when dry rags are applied, or by being expoſed to the air, we have reaſon to think that the ſkin would be much ſooner brought on the navel, while the parts were ſoaking in the *liquor amnii*; for we have very convincing proof what the effects of ſuch a ſalt liquor is in the ſaliva, which not only ſerves to keep the mouth ſoft and flexible, but very ſoon heals wounds or mild abſceſſes there; the urine will ſcarce allow ſurgeons to keep the wound in lithotomy long enough freſh, but, notwithſtanding their utmoſt efforts, it often renders the paſſage callous. The ſinovia of the joints, the glary liquor of tendinous or ligamentous ſheaths, and, in ſhort, all ſuch liquors of our body do the ſame. From all which I would conclude, that the navel-ſtrings, which are the ſubject of our preſent inquiry, were broke very ſoon before birth; and if I ſhould allow the time to have been a day or two, the foetus might continue ſo long in life, without any new ſupplies of nouriſhment, as well as it does ſeveral days after birth, when it ordinarily takes only ſome purgative ſyrups; and you have recorded † an inſtance of a child that lived ſeven days after birth, tho' nothing could paſs out of its ſtomach into its guts to nouriſh it. The probability of a child's living without nouriſhment in the womb ſo long as I have allowed, is certainly much greater than that it ſhould continue in life days, weeks, or months, after the waters have been evacuated, and continued to be conſtantly diſcharged †, on the ſuppoſition which the gentlemen of the other ſide make of its receiving its food moſtly by the mouth for ſome time before birth. I would therefore conclude from the whole, that theſe children whoſe hiſtories Chatton and Rommelius relate, were under no neceſſity of being ſupplied with nouriſhment any other way than by the navel, and conſequently do not prove what was deſigned by appealing to them.

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† Mauriceau maladies des femmes groſſes, liv. ii. chap. 9. Ruyſch, in theſ. obſerv. adverſ.

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† Medical Eſſays, Vol. I. Art. 14.

A more direct proof of the umbilical veſſels not being ſo neceſſary as I argue for, is offered by examples of foetuſes who had no navel-ſtring. I know only two caſes where this is alledged; one is told by Vander Wiel; the author of the other is anonymous.

Vander Wiel ſays ‡, " In the time of the " Fair at the Hague, in the year 1683, a male " child, a year and three months old, born " of poor parents in February 1682, was ex" poſed for a ſhow. When it was born, there " was not the leaſt veſtige of the umbilical " rope; and therefore the midwife had no " occaſion to ſeparate it from the child's bel" ly. The navel alſo was wanting; but in" ſtead of it a broad round red ſpot, as large " as a ſtiver piece of money, covered with a " very thin ſkin, appeared in the hypogaſtri

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† Mauriceau dans pluſieurs obſervat.

‡ Obſerv. cent. poſt. pars 1, obſerv.

" um, near to the ſhare-bones; within the " circumference of which ſpot two papillulæ " or aquæducts were ſeen, at an inch diſtance " from each other, by which the urine was " evacuated. The child died at three years " of age." In the notes upon this obſervation he tells us, its body was not opened after its death.

This ſeems to me ſuch an hiſtory, as one can rely very little on; for it would appear to be on the parents information that Vander Wiel aſſerts there was no navel-ſtring; their buſineſs to be ſure was to make the caſe as wonderful as they could, to draw in cuſtomers. There is not any where mention of ſecundines, to know whether the umbilical rope was hanging at them; and the breadth of the ſpot anſwers very well to the navel; which probably would have been made as certain by a diſſection, as it was conſpicuous in another caſe related towards the end of the notes upon this obſervation, and very like to it in all the principal circumſtances, excepting that here the umbilical rope was evident. (See ſuch an hiſtory in Vol. III. Art. 14.) Since then this hiſtory is ſo imperfect, and on an hearſay, while the very caſe which the author tells as analogous to it, brings it to make for my ſide of the queſtion, I am hopeful it will not be advanced any more againſt me.

The ſecond caſe of a navel being wanting, is told in a letter of an anonymous author in words to this purpoſe †: " An hare big with young being caught, its belly was carefully opened, and immediately three conſiderable balls tumbled out; they were of a whitiſh colour externally, with this difference, that the coat of the firſt which fell out was not pellucid, whereas the other two were ſurrounded with a pellucid coat. I conſidered theſe globes accurately, and could not obſerve on their ſurface the leaſt mark of their adhering any where. I alſo with great care examined the uterus that was cut out, which I found perfectly entire, and of a natural ſize, without any marks of a conception, or of any breach in it. When I had cautiouſly cut theſe globes or balls, I found in each a little hare covered all over with fur, and of the bigneſs new-kittled hares commonly are. The membranes ſurrounding them were eaſily taken off whole and entire; but I could find no veſtige of the umbilical rope either in the ſeparated membranes or bodies of the hares. After this I viewed the membranes more exactly, diſcovering them to be double and eaſily ſeparable. In the ball whoſe membranes I ſaid were opaque, the external one was thicker; the one within this was thin and pellucid, its internal ſurface being covered with a yellowiſh mucus. Internally there was a ſpace about the bigneſs of a guilder piece of money, that reſembled a ſmall uterine placenta, equally covered with a thin ſkin, but without any veſtige of the umbilical rope. I cut the placentulæ, and found them internally liver-like (hepatiformes), whitiſh, of

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† Commerc. literat. Norimberg. 1731. ſpec. 27. art. 4.

" a ſoft vaſcular texture, full of canals and pa-
" pillulæ. Theſe are what were partly faithfully
" related to me, and partly were obſerved and
" remarked by myſelf. Indeed, having never
" had an opportunity, I did not ſearch into
" the foetuſes of hares before. This whole
" matter ſeems a paradox to me."

Many inconſiſtencies diſcover themſelves in this obſervation at firſt reading, even in the part of it where one would think the author is telling what he ſaw. Two of the balls are pellucid, and the third has only a round ſpot on the interior ſurface of its membranes, which he ſeems to expect ſhould have had umbilical veſſels coming out from it, and is much diſappointed at miſſing of them: After, I ſay, he has thus made it evident, that there were no placentæ, yet afterwards hepatiform vaſcular placentæ, are very accurately deſcribed.------The membranes are taken off whole and entire from the foetuſes incloſed in them, after the globes containing the foetuſes had been cautiouſly cut.-----The placentæ are hepatiformes, either from their ſhape, form, and bulk, being before inviſible; or they are like livers, becauſe they are white.-----Though it is now agreed that a placenta is no more than numerous ramifications of the umbilical veſſels, yet here are placentæ, without their veſſels being derived from any part; which to me appears to be an expreſs contradiction and impoſſibility.-----Though the whole affair is a paradox to him, he has not the curioſity to open one of the young hares, that he might ſee whether the umbilical veſſels were wanting within their bodies as well as without.

Though this gentleman has concealed himſelf in a country where people are far from ſhunning to be the firſt public tellers of ſuch prodigies of nature as come to their knowledge, yet I ſhall not doubt of his ſincerity; but cannot help ſaying, that his ignorance, at leaſt in the ſtructure of the foetuſes of hares, which he ſays he never had an opportunity of diſſecting before, has led him into miſtakes numerous enough to give me ſufficient cauſe to decline his teſtimony. And as to the principal thing which relates to the preſent queſtion, the want of a *funis umbilicalis* I think I can, with the help of Needham's third table of his obſervations *de form. fœt.* make an apology for his not diſcovering it, by ſhewing that others, more accuſtomed to the diſſection of hares, might have miſſed of it as well as he. Needham repreſents the foetus of a rabbit with its ſecundines (which differ ſcarce any thing from thoſe of a hare) where that part of the umbilical rope in which all the veſſels are incloſed, is very ſhort, and ſeven or eight conſiderable branches go from it ſeparately to the placenta. If theſe veſſels were all broke at the place where they ſeparate, by the running of the dam, or falling out of the balls, or in opening the membranes, the ſhort navel-ſtring would contract, and be hid by the fur, ſo as to be diſcovered with difficulty; and the extremities of the broken veſſels would appear on the placenta like papillulæ, and the placenta would be vaſcular and whitiſh-coloured, as the anonymous obſervator has deſcribed it. This account is natural and eaſy enough to bear a ſtrong air of truth with it.

If then accurate inſtances are recorded of fœtuſes being nouriſhed without any poſſibility of their receiving aliment by the mouth, or into their chylopoietic organs; and, if there can be no diſtinct unexceptionable proof made out of their being ever ſupplied with nouriſhment without the navel-ſtring, I muſt determine the firſt problem by affirming, That the umbilical veſſels are abſolutely neceſſary toward the nouriſhment of a fœtus; and that the mouth is not ſo.

PROBLEM II.

Whether the Liquor contained in the Amnios *is proper* Food *for a* Fœtus.

WHEN we conſider this liquor as it is ſometimes repreſented, to wit, that it is at firſt mild and mucaginous, and afterwards becomes thinner, more acrid and urinous, it would appear ill calculated for the food of the fœtus in its different ſtates: For, while the parts of a fœtus are weak, and have little action, they are not ſo well fitted for digeſting and breaking the coheſion of a fluid, whoſe particles ſeparate with ſuch difficulty; whereas it would have been much more capable of digeſting ſtronger food after its ſtomach, guts, and other chylopoietic organs were become ſtronger; conſequently this liquor ought to have been of the reverſe conſiſtence to what is above deſcribed, as we ſee happens in a caſe which muſt be allowed to be very analogous to the preſent ſubject, that is, in the conſiſtence of milk, which is at firſt thin and purgative, but afterwards becomes thicker and ſtronger food.

Needham may perhaps be ſaid to have deſcribed this liquor really to be as I have argued it ſhould have been formed; for he tells us *, " That the liquor of the amnios becomes conſiderably thicker than it was at firſt in the larger animals." And, in another place †, he affirms, " That it gradually becomes thicker, and ſoon acquires the conſiſtence of the white of an egg; nay, in the laſt months of a cow's going with young, it is thicker and more viſcid than any gelly". This agrees exactly with what I alſo remarked in cows, whoſe fœtuſes, with their ſecundines, I have examined in a great many different ages. But neither, in this view of the conſiſtence of this liquor, does it appear proper nouriſhment; for, according to the old adage, *Eſt modus in rebus*; though the food of a fœtus might be expected to be groſſer in the laſt months, when its organs are ſtronger, than ſoon after conception, yet a liquor ſo very thick and viſcid as Needham deſcribes, would be altogether indiſſoluble, and very improper for nouriſhing a creature whoſe organs of digeſtion are ſtill in a tender ſtate, and for whom nature has provided ſuch a dilute fine liquor as milk is, to ſerve for food a conſiderable time after the birth, when all its parts are become much more robuſt and ſtrong. If we can make any judgement in this affair, from a view of the ordinary courſe and tenor of nature, we muſt think that if the *liquor amnii* had been deſigned to be ſwallowed for food, it would have been at firſt a thin ſerum that gradually came afterwards near to the conſiſtence and nature of milk; but this I never ſaw, nor do I know, that any has affirmed this liquor to have been ever obſerved of ſuch a proper conſiſtence in the different times of gravidation; and therefore muſt conclude that it is not deſigned to ſerve for food.

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* Obſerv. anat. de form. fœt. cap. 3.

† Ibid. cap. 5.

The *liquor amnii* ſeems not only thus improper food, while it is in a natural ſtate; but there are examples of its being ſo much depraved, that it muſt have been of the worſt conſequences to the fœtus to have fed upon it. Such is the hiſtory related by Dr Bellinger *, of a woman who had laboured under a virulent gonorrhœa during her pregnancy, of which ſhe was cured a very little time before her delivery. The waters were very putrid and foetid, and the membranes tender and almoſt rotten; yet the child was born well and healthy, which the Doctor thinks could not have happened, if this child had received ſuch putrid waters into its bowels.

The force of this obſervation is attempted to be taken off, by remarking, That poiſons and other noxious ſubſtances, do leſs harm when taken into the ſtomach, than when immedi-

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* Tract. de fœt. nutr. cap. 9.

ately mixed with the blood.——Every body, I believe, will grant this to be true, if the quantities received both ways are equal: But it is of no uſe in the preſent queſtion, unleſs this other propoſition is alſo proved, viz. That ſuch a quantity of this putrid liquor, as is ſufficient to nouriſh the fœtus, muſt be taken in either by the mouth or umbilical veſſels; then indeed, by a plain ſyllogiſtical conſequence, it follows, that ſuch a quantity of the putrid *liquor amnii* will do leſs harm, by being received at the mouth, than if it had been conveyed by the navel. I can however ſee no reaſon to allow the minor propoſition to be true; nor am I ſenſible of being brought, by a denial of this propoſition, under a neceſſity of giving the placenta a faculty of ſeparating the pure from the impure, or of having the goodneſs to ſend the impure to the amnios, where it does no harm, and the pure to the fœtus, where it does much good. I preſume every one's practice has taught him, that there is no neceſſity to ſuppoſe the whole maſs of the mother's blood to have been tainted by the virulent matter of this gonorrhœa. I can imagine this diſeaſe to have had its ſeat at firſt in the vagina, and then to have attacked the internal *os uteri* and the mucus with which it is commonly filled in the time of pregnancy: See an inſtance of an ulcerated *os uteri* from ſuch a cauſe by Des Noves †, and this corrupted mucus might communicate its fœtor to the liquor of the amnios, without the veſſels of the placenta having received one drop of this putrid liquor; and therefore, according to the doctrine which I endeavour to ſupport, the child might remain healthy and ſound, unleſs the waters had been long enough acrid to affect the ſurface of its body; whereas, had ſuch putrid liquor ſerved it for food a very ſhort time, it ſcarce could have eſcaped without ſome diſeaſe. Nay, from what was ſaid concerning the ſource of the *liquor amnii* being either the fœtus, or its umbilical arteries, (*vid.* § 24. and 26.) it neceſſarily follows, that the *liquor amnii* in this caſe could not have been corrupted in any other way than what I have juſt now aſſigned; for we can never imagine that a child could have ſuch corrupted liquors circulating in its veſſels, without being tainted.

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† Morgagn. adverſ. anat. 4. animad. 49.

It may be objected from what I have ſaid (§ 25.) of the branches of the umbilical vein abſorbing the *liquor amnii*, that ſuppoſing this liquor to have been corrupted in the manner I have explained it, the fœtus could not have remained ſound; becauſe the abſorbent veins muſt have taken up this corrupted ſtuff, to mix it with the blood of the fœtus. To this I anſwer, That the quantity taken up by abſorption is but ſmall, and the time would appear to have been but ſhort, in which it could here have been abſorbed. Next, I would obſerve, That, though a gentle contraction is neceſſary for increaſing abſorption, yet very acrid ſubſtances irritate abſorbent veſſels to ſuch a ſtrong contraction, as makes them incapable of performing their functions, which I take to be one principal reaſon why poiſons when ſwallowed do ſo much leſs harm, than when they are immediately mixed with the blood: And hence the very acrid kinds of them are obſerved to produce all their bad effects on the *primæ viæ*, without any appearance of their having entered the blood-veſſels †: So that we have reaſon to think the child to have been in much leſs danger of ſuffering, by what the abſorbents of the amnios could take up in ſuch a caſe, than if the putrid liquor had been ſwallowed for food, when it would ſurely have hurt the alimentary tube; and, if it had gone further, it muſt have tainted the whole maſs of blood; or, if the lacteals had refuſed it entrance, the child would have been famiſhed; and, at any rate, it would have laboured under ſome diſeaſe; whereas in the hiſtory it is affirmed to have been ſound and healthy.

WHETHER then we conſider the liquor of the amnios in a ſound or morbid ſtate, it appears to be very ill calculated for ſerving as food to be taken into the ſtomach of a fœtus.

PROBLEM III.

Whether the Liquor Amnii *paſſes into the Stomach of a* Fœtus.

THE impoſſibility of having ocular demonſtration of the fact inquired after in this third problem, has occaſioned a great many circumſtances to be uſed by way of arguments, each of which we muſt examine; and, if they all point one way, and the concluſions ariſing from them are favoured by the ſolutions of the two preceeding problems, the general concluſion concerning the nutrition of the fœtus will be ſufficiently warranted.

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† Wepfer de cicut. aquat. Mead on poiſons.

THE firſt thing I offer againſt the *liquor amnii* paſſing into the ſtomach of a fœtus is, the improbability of a liquor that is to ſerve for food, being previouſly ſent into the fœtus's own veſſels, there to circulate and to be ſecerned in order to prepare it for being ſwallowed, which § 24. and 26. ſhew would be the caſe on this ſuppoſition.

No matter where this liquor is ſeparated, or from what ſource it comes, will the advocates of the other ſide ſay, if its paſſage into the ſtomach can be proved; which they infer does happen from,

1. THE reſemblance which they alledge is to be ſeen between the liquor of the amnios, and that of the ſtomach.

I have already deſcribed the liquor of the ſtomach, as I have ſeen it in fœtuſes of different animals, (See § 30.) but have not had opportunities to obſerve the liquor of the amnios in the different ſtates of a ſufficient variety of fœtuſes; and therefore ſhall firſt conſider it, as it is repreſented by the Gentlemen who differ in opinion from me, and afterwards ſhall ſuppoſe what I ſaw in cows to be general.

If the liquor of the amnios is at firſt mild and mucaginous, and afterwards becomes thinner and more acrid, it differs greatly from the liquor of the ſtomach, which, on the contrary, turns gradually more viſcous as the fœtus increaſes, (§ 30.) Nor will it ſuffice to ſay, that the finer parts are abſorbed by the veſſels of the ſtomach, for, by ſuch an abſorption, it could never happen, that a thin watery liquor would leave a greater quantity of groſs mucus than a thick gelly would do; eſpecially when there is leſs time allowed for the abſorption of the watery liquor, by the quicker digeſtion which the fœtus muſt be ſuppoſed to have, when it becomes larger and ſtronger. Upon which account too the contents of the ſtomach would be more and much oftner diluted by the thin food ſwallowed in greater quantities, and more frequently. And then we might expect ſometimes to ſee the thin liquor lately taken down, and the thick remains of the former food diſtinct, without being blended, as we obſerve the mucus of the ſtomach of adults to keep in a ſeparate body from any thin liquors drunk ſome little time before they are vomited: This, however, is never obſerved in the fœtus, though it has neither reſpiration, vomiting, nor other conquaſſatory preſſure on its ſtomach, to incorporate the different liquors contained there; and therefore there is no probability that they ſhould be ſo intimately blended. So that, on the whole, the liquors of the amnios and ſtomach are ſo far from reſembling each other in this caſe, that their appearances diſcover them to be very different, and deſtroy the ſuppoſition of that of the amnios ever being ſent down into the ſtomach.

Let us next ſee how well the *liquor amnii* of cows, taken for a general rule, will ſerve to ſupport this alledged reſemblance. It muſt indeed be owned, that, till the liquor of the amnios comes to a certain degree of viſcidity, which, as near as I could gueſs, happens when the cow has gone three fourths of her time, the appearances of reſemblance are pretty favourable; only, while the fœtus is very young, the objections to the former ſuppoſition take place; becauſe, for ſome time, this liquor is glairy, then becomes more watery, and afterwards thickens, till it comes to much the ſame conſiſtence with that in the ſtomach, at the period juſt now mentioned, after which the appearances are quite deſtructive of any reſemblance; for the *liquor amnii* becomes conſiderably thicker: And, even during that favourable period, when their conſiſtence is ſo like, I have often ſeen the *liquor amnii* of a dark brown colour and turbid, while the liquor in the ſtomach was of a very pale watery colour, and pellucid; and at other times I have obſerved the contrary of this, and other remarkable varieties of appearances, which perſuades me that there is no communication between the cavity of the amnios and the ſtomach.

You certainly have remarked, that I have made no compariſon of the taſte, ſmell, or coagulation of theſe two liquors, which is omitted deſignedly; becauſe neither ſmell nor taſte are very greatly different in any of the ſaltiſh watery liquors of the body; for that, in the pericardium, thorax, abdomen, joints, the ſaliva, &c. of a fœtus, ſmell and taſte as like to either of the liquors that are the immediate ſubject of our inquiry, as theſe two do to each other; and different ſalts, heats, &c. produce much the ſame effect upon all of them.

2. THE liquor of the amnios is ſaid to be generally conſumed, or in very little quantity, at or near the birth; from which it is inferred, that it has been ſwallowed down by the fœtus. De Graaf, in confirmation of this fact, tells us †, that he diſſected a rabbit when ſhe was about to kittle: In the time of his diſſecting the mother, ſome of the fœtuſſes came out with their membranes entire, and without any liquor contained in the amnios or chorion. He obſerved alſo the ſame thing in the others that were taken out of the uterus; and, to be aſſured that the coats were not broken, he diſtended the membranes with air, and found they were entire.

Whatever truth is in the general propoſition, I think De Graaf's obſervation, which he fancies equal to a proof of it, is good for little; becauſe it ſhews only what happened in that particular animal, without determining what the quantity of the liquor is for ordinary in rabbits; far leſs does it teach us what we ought to ſay of animals in general.

I am certain that a great many creatures have not all this liquor conſumed at birth, having had my arm wet up to the ſhoulder when the waters broke, while my hand was in the vagina, in ſome caſes where neceſſity has obliged me to act the accoucheur to women;

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† De mulier. organ. cap. 15.

and we ſee every day how the cloaths are wet when the waters come away. I have alſo ſeen a remarkable quantity of liquors ſtill remaining in the amnios after the delivery of ſeveral animals; but my obſervations have not been ſufficient to determine (except in one ſpecies of animals, cows,) what proportion the liquor of the amnios bears at birth to what it was formerly; and I know no author, except Harvey, who ſeems to write on this ſubject accurately, and from obſervation. When he is endeavouring to prove the *liquor amnii* to ſerve for food to the fœtus, he raiſes this objection to himſelf *, "One might believe, that the liquors "which we appointed for food to the fœtus "are excrementitious, and chiefly on this ac-"count, becauſe they increaſe as the fœtus "turns bigger; and, in the birth of ſeveral "creatures, when it is probable all the aliment "is conſumed, they are ſeen in great plenty." And where he is treating of the human waters, and is proving the *liquor amnii* to be no excrement, he ſays †, "It is ſeen in leſs quantity "proportionally *(pro proportione)* near the "time of birth." Allow me to add what obſervations frequently repeated have taught me, that in cows this liquor is evidently decreaſing in its quantity ſome months before the delivery.

You ſurely ſee what a loſs I muſt be at to lay down any general rule concerning the proportional quantity of the *liquor amnii* in the different times of gravidation of different animals. What the Gentlemen who differ in opinion from me will undoubtedly be beſt pleaſed with, is to take my own obſervations on cows as the general rule; which I am ſatisfied rather to do, than be expoſed to perpetual wrangling about this fact. Let us ſuppoſe then, that the liquor of the amnios increaſes in its quantity for ſome more than the firſt half of the time of geſtation, and after that decreaſes, till at the birth it is in very ſmall quantity. The conſequence they draw is, that the conſumption of the liquor is made by its paſſing into the ſtomach of the fœtus. But, with ſubmiſſion, they cannot come ſo ſoon at their concluſion: They muſt previouſly prove one or other of theſe two propoſitions, either that the liquor does go down into the ſtomach, or, that it cannot poſſibly be carried off any other way. The truth or falſhood of the firſt of theſe depends on the arguments examined in the ſubſequent part of this eſſay, and muſt ſhare the ſame fate with them; and, as to the latter propoſition, I flatter myſelf that I have demonſtrated another paſſage by which it may go, (§ 25.) and really by which only we can ſuppoſe it to go, in order to account for all the phænomena, which I would do thus. While the fœtus is weak, the arteries of the amnios pour out more than the veins take up, (§ 15. and 26.) and the heat, aſſiſted by the conquaſſatory motions to which the liquor is expoſed, melts down its particles, and makes it appear more watery: But, when the veſſels of the fœtus become ſtronger, and conſequently the veins abſorb more, (§ 15.) the quantity collected does not increaſe ſo faſt, and in ſome time the liquors thrown out, and thoſe abſorbed are pretty near equal, when the quantity of the *liquor amnii* remains much the ſame; till at laſt, the veins prevailing, the quantity diminiſhes, and continues to do ſo till birth. But, ſeeing the veins take up chiefly the finer particles, what they leave muſt become more thick and viſcous. All this will, *cæteris paribus*, be obſerved in different animals proportionally to the ſizes and numbers of the veſſels. If what Rouhalt * affirms be true, of the human *liquor amnii* being always in a watery ſtate, (which, ſo far as I could obſerve, it is rather more than in other creatures;) the arteries or exhalant veſſels are ſmaller, and the veins perform leſs abſorption than thoſe of brutes do.

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* De humor. uter.

† Excercit. 56.

This *liquor amnii* ſerves to keep the fœtus and its membranes ſoft and extenſible, hinders them to cohere, and defends the fœtus from preſſure or other violence, which it needs moſt to be protected from, while its parts are very tender, for which this liquor is then, at leaſt, in greater proportion than afterwards, when the fœtus is firm and ſtronger; and, by the liquor's real or proportional quantity being leſs towards the time of birth, the mother is not in ſo much danger of ſuffering by the overſtretching of her uterus, as ſhe certainly would be, if the waters increaſed proportionally with the fœtus.

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* Mem. de l'Acad. des ſciences, 1714.

What I have ſaid of the changes produced on the *liquor amnii*, will perhaps be better underſtood, by naming ſome analogous caſes; ſuch are, the viſcid nature which the water in a dropſy of old ſtanding acquires; the progreſs of incyſted tumors from a hydatis to a ſteatom; the courſe of a large oedema at the end of an acute diſeaſe, to its changing into what the ſurgeons call a white ſwelling, and at laſt to its cure. None that I know ever affirmed the liquors reaſſumed into the maſs of blood in any of theſe caſes; nor what is conconſtantly abſorbed in a natural ſtate, from the pericardium, thorax, abdomen, &c. to ſerve as nouriſhment; and therefore I cannot expect that what is juſt now ſaid of the *liquor amnii* will weaken what I ſaid formerly of the improbability of a creature's furniſhing its own food.

3. Besides theſe arguments deduced from the quality and quantity of the *liquor amnii*, it is further pleaded by thoſe who favour the opinion of the nutrition of a fœtus by the mouth, that the fœtus ſhews it was in uſe to take down aliment while it was in the womb, by its knowing how to ſuck as ſoon as it is born.

This is building on that *divinæ particula auræ*, that principle which is commonly called *Inſtinct*, and of which we obſerve daily examples in propagating the ſpecies, and preſerving the individuals among animals, but of which we have no comprehenſion. Can any one aſſign a phyſical cauſe, why of ducklings and chickens hatched under the ſame hen, the former

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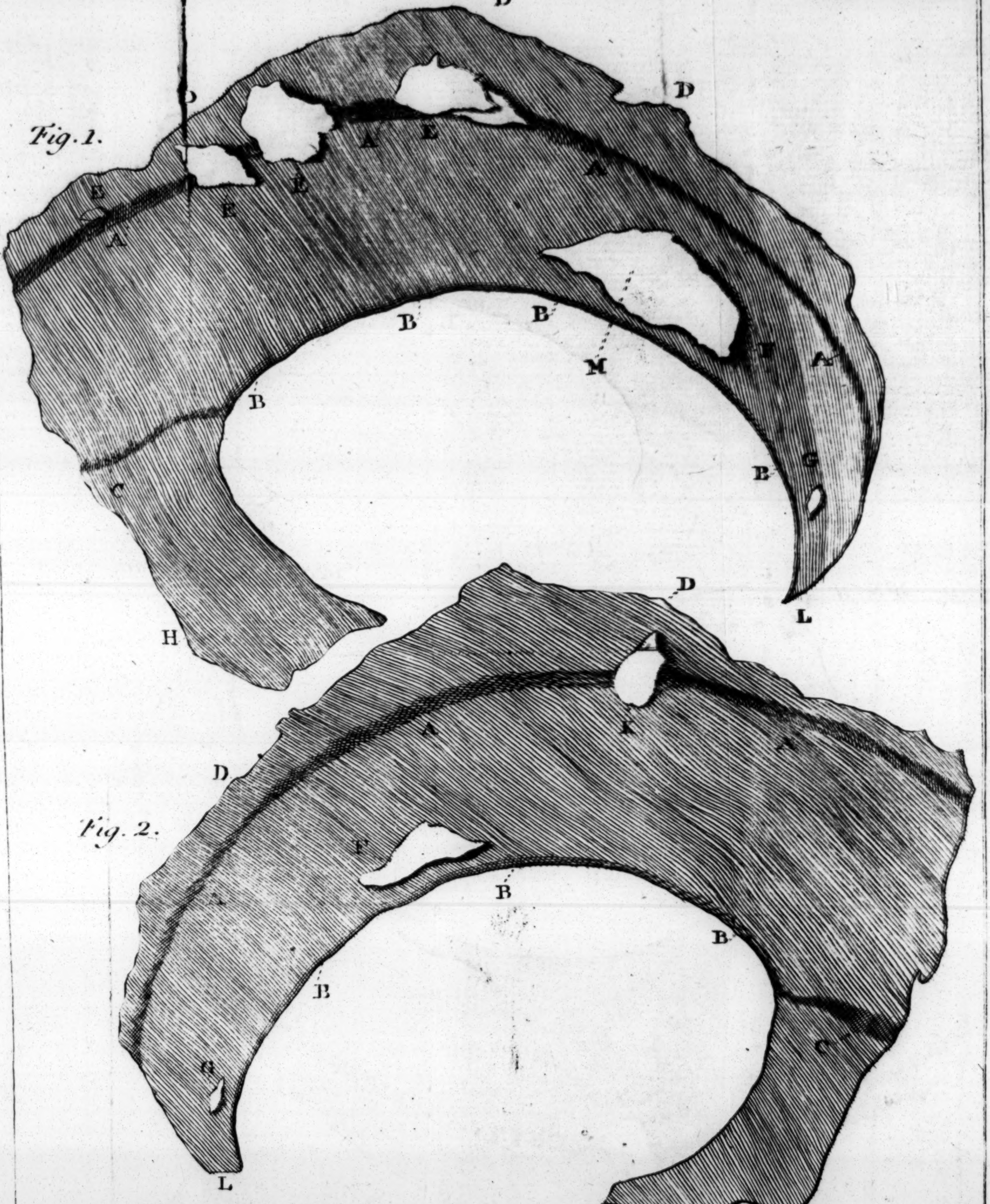
Fig. 1.

Fig. 2.



Ad vivum del: G: Robertson

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former ſhould, contrary to the example and anxious warnings of the parent, run into each pool they can come at, while the others ſhun going into water? Who taught a young ſtallion that has been always kept out of ſight of mares, either the inſtruments or manner of generation? And, in the preſent caſe, what is there in the leaſt analogous to a nipple within the amnios, on which the fœtus could have practiſed ſucking while in the womb? Theſe are ſubjects we may admire, but loſe ourſelves whenever we pretend to account for them.

4. HERE is, ſay they again, a liquor in the amnios conſtantly applied to the orifice of a canal that leads to a cavity, and therefore it probably will paſs down there.

To this it is anſwered, That there are impediments both to the entry and paſſage of the liquor. The firſt is, the lips being generally found ſhut in a fœtus: This however is denied by the other ſide to be true in fact. In my opinion it is of no great conſequence in the argument, whether the lips of a fœtus are found to be contiguous or not, unleſs ſome other circumſtances can be determined at the ſame time. If the lips, for example, are found ſhut, it is neceſſary to know whether the fœtus, while in life, had not, or did not exerciſe the power of opening them. And if, on the other hand, the mouth is ſeen open, we ought to inquire whether that is not owing to the ſhrivelling contraction or handling of the parts after death. In moſt of the fœtuſes of cows which I looked at, the lips were contiguous; in ſome few I have ſeen the point of the

tongue

tongue lying between them; and, in all the human fœtuſes which I have had the opportunity of ſeeing, the lips were contiguous. One might indeed judge that the mouth generally would be ſhut in a living fœtus, from what was ſaid (§ 29.) of the muſcles of a fœtus being left to their natural action; and from what we ſee in moſt animals when they are aſleep. The force by which the lips are kept contiguous, will, however, not probably be ſo great as that by which the eye-lids are ſhut, becauſe the *ſphincter oris* does not ſeem to be ſo much ſuperior to its antagoniſts, as the *orbicularis palpebrarum* is to the *rectus aperiens palpebram.*

This obſtacle of the lips is not the only one; for the under-jaw, being ſupported by its levators, will keep the tongue applied to the roof of the mouth; and the pharynx always is ſhut in animals, unleſs when the voluntary convulſive action of deglutition is performed. That I might know how theſe parts appeared in a fœtus, I opened the mouths of ſeveral, then cautiouſly depreſſing the point of the tongue, I ſaw the root of it raiſed up againſt the palate. When the root was alſo depreſſed, I obſerved the *velum pendulum* was hollow below, where the tongue had been lodged, and was ſo convex above, as to ſhut up the paſſages to the noſtrils. As to the pharynx being always ſhut, it is univerſally known; but, to make ſure of it, I put a funnel into the mouths of ſeveral fœtuſes, after their tongues were depreſſed, and, holding them erect, I poured water into the funnel, but none paſſed farther than the root of the tongue.

I cannot omit the mention of the remarkable mechaniſm employed here, for keeping the tongue cloſely applied to the palate, chuſing the human foetus, as beſt known, to illuſtrate it by. You know that the force exerted by muſcles in their natural contraction is encreaſed and diminiſhed proportionally to their being more or leſs ſtretched. You alſo know, that the muſcles coming from the jaw to the tongue and *os hyoides* are thicker, conſequently ſtronger than thoſe that come to theſe parts from the ſternum and ſcapulæ. Now, when a foetus lies with its neck bended, ſuch of thoſe muſcles as are ſituated below the *os hyoides* are conſiderably relaxed, which thoſe above it are not. Since therefore theſe latter are naturally ſtronger, and gain ſo much over the others by the difference of their ſtretching, it is no wonder that they pull the *os hyoides*, tongue, &c. ſtrongly upwards, and preſs them ſo ſtrongly againſt the upper part of the fauces and mouth, as to leave their print in the flexible parts, and, by bringing all the ſides of the paſſage into the oeſophagus cloſe together, prevent any thin'gs getting down into it.

Since then there are ſuch obſtacles to be overcome, the *liquor amnii* cannot paſs, unleſs either the force with which it is ſqueezed is ſuperior to the reſiſtance, or the foetus muſt perform the action of deglutition.

I ſhall not ſtop here to conſider the bad conſequences which ſuch preſſure on the very tender parts would have, while the chaſm of the mouth is not ſhut (§ 28.) to make reſiſtance; but ſhall proceed directly to examine what is called by ſeveral writers an experiment which demonſtrates the paſſage of the liquor of the amnios into the ſtomach: It is related thus by Mr Heiſter †: "I received a "full formed perfect foetus of a cow, incloſed "in the uterus and membranes, in cold winter "weather, where not only the liquor of "the amnios which ſurrounds the foetus was "frozen, but the ſame liquor was found frozen "in the mouth, oeſophagus and ſtomach, like "one continued ſubſtance: The column of "ice in the oeſophagus was about an inch "thick. I happened to ſee the ſame another "winter."

If any uſe is to be made of this experiment, in proving the *liquor amnii* to be ſent into the ſtomach, it muſt be ſaid, that the freezing of the liquors did no more than ſhew more diſtinctly how the waters were lodged before they were turned into ice; and if this is true, then we would ſee all the contents of the ſtomach run out, whenever a foetus is ſuſpended with its head loweſt; or, if the mouth and oeſophagus are ſlit open, while the foetus is hanging by its mouth after being taken out of the *liquor amnii,* we would obſerve part of the column of water to run out at every cut, and all the canal would be ſeen full below where it is opened. Theſe things would certainly, I ſay, be ſeen, if the experiment did no more than conſolidate the water naturally lodged in the oeſophagus. But, after many repeated trials, I can aſſure you, that none of theſe things do happen; and therefore it is more reaſonable to believe, that the icy column which Mr Heiſter ſaw in the oeſophagus, was introduced there from the amnios or ſtomach by the immenſe expanding force of freezing liquors confined within the frozen rigid uterus and ſecundines, which every body knows is far ſuperior to any reſiſtance can be ſuppoſed here.

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† Compend. anat. not. 37.

To make myſelf ſtill more certain about the nature of this experiment, I repeated the trial, already mentioned, of pouring water into the mouth through a funnel; and, that it might not be thought to be hindered by the liquors already contained there, I emptied the ſtomach before I began to pour the water; but ſtill the ſame ſucceſs of nothing paſſing down attended it. To confirm all more, I puſhed a trocar into the amnios of ſeveral calves involved each in its uterus and ſecundines, and forcibly injected milk through the canula of the trocar; then I cauſed the uterus to be preſſed ſtrongly by ſeveral people, ſome times equally, other whiles alternately; but though the milk was thus intimately blended with the *liquor amnii*, none of it would paſs into the ſtomach; which to me is a demonſtration, that Mr Heiſter's experiment ought not to be mentioned as a proof of what naturally happens to a foetus, but only as a trial of the force of expanſion in freezing liquors.

It is hardly worth while to take notice of thoſe who ſay, that the preſſure which the *liquor amnii* ſuffers, muſt make it go down thro' the open mouth into the vacuum formed in the ſtomach. For the mouths of foetuſes are oftner found ſhut than open; there never can be a vacuum in the ſtomach, and the external preſſure muſt be equal on the ſtomach as on the mouth.

5. THE only other ſuppoſition to be made of the foetus taking the *liquor amnii* into its ſtomach is, that it ſwallows down theſe waters, by performing the voluntary convulſive action of deglutition.

The gentlemen who aſſert, that the foetus does perform deglutition, ſay, that, becauſe it has the organs of deglutition, and a capacity of exerciſing them, therefore it performs this action as well as it employs ſome other muſcles in its ſtirrings. But this way of reaſoning can never ſerve their purpoſe, becauſe there are many other actions which a foetus has the organs and capacity to perform, and yet evidently does them not; they muſt therefore previouſly ſhew ſome neceſſity the foetus is under to perform this particular action, or ſome manifeſt advantage it is to gain by it. There can be no ſuch neceſſity, and I hope it appears by what was ſaid in the ſolution of the ſecond problem, and elſewhere in this paper, that the taking the *liquor amnii* as food, the only advantage to be imagined here, would be hurtful to them And therefore, if the will did contribute to the actions of theſe organs of deglutition in a foetus, it would be directed by inſtinct to keep the paſſage into the ſtomach cloſe ſhut, inſtead of forcing down the *liquor amnii* into it.

That ſometimes foetuſes ſwallow the contents of the amnios is evident, ſay ſome, from the *foeces alvinæ* having been ſeen both in the amnios and ſtomach of foetuſes *. And, add they, if a foetus does ſometimes ſwallow, it probably does ſo always.-----To which it may be anſwered, 1ſt, That in a few extraordinary caſes here referred to, it is not certain that the foeces were ſwallowed; for ſince genuine meconium is to be ſeen in the jejunum and ilium of foetuſes †, and new-born children have vomited meconium ‡, why might not the foeces found in the amnios in the morbid examples cited have been brought up from the ſtomach? Needham, one of the authors quoted, gives a very reaſonable objection to the foeces being ſwallowed, if even they were evacuated at the anus of a foetus; for, ſays he, "The thickneſs or viſcidity of the *liquor* "*amnii* is ſo great, that it does not eaſily mix "with them, neither can what is voided by "the anus be allowed to come to the mouth "of the foetus."----2dly, Tho' it were granted, that in the above caſes the foeces had been ſwallowed, the concluſion that the contents of the amnios are ordinarily ſwallowed, has been too haſtily made. They might as well infer from theſe caſes, that the *foeces alvinæ* are for ordinary to be found in the cavity of the amnios, which every body knows to be falſe. We may endeavour to account as well as we can for theſe morbid phoenomena, but we muſt not draw ſuch haſty general concluſions from them.

Slade

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[*] Needham de form. foet. cap. 5. Steno in act. Hafn. tom. 2. obſ. 89.

[†] Haller not. f. in Boerhaave. inſtit. § 683.

[‡] Mauriceau obſ. 300.

Slade † obſerved, among the glutinous foeces contained in the rectum of a foetus calf, hairs of the ſame colour with thoſe which covered the calf, from which it is inſerred, that the calf muſt have ſwallowed theſe hairs.----- Whoever makes this inference muſt likewiſe ſay, that the calf had licked itſelf with its tongue a conſiderable time before, and with it brought off theſe hairs which were ſound in the rectum: For hairs do not fall off from foetuſes for ordinary, and Slade takes no notice of hairs in the liquor of the amnios or the ſtomach, tho' he deſcribes both, and in ſuch a manner as to ſhew, that the calf did not ſwallow the liquor of the amnios, for that of the ſtomach was more viſcid and whiter coloured than it. Why might not theſe hairs have been formed in the guts of this calf, as they are formed frequently in the omentum, urinary organs, heart, arteries, inteſtines? &c.

6. Lest the direct proof of the *liquor amnii* being preſſed or ſwallowed down ſhould fail, there are ſome other arguments advanced that are thought to imply a neceſſity of ſuch a liquor having been taken down; among the reſt it is argued, That it is neceſſary to keep the chylopoietic organs of ſufficient dimenſions, for receiving the due ſupplies of food after birth.

If it had been conſidered how very languid and ſlow the motion of the contents of theſe organs muſt be in a foetus, where the contractile tone of its own fibres is ſo very weak, and where there is no exterior alternate preſſure by reſpiration, or any other power, it might have been thought that the liquors ſupplied by the veſſels of theſe hollow viſcera would be ſufficient for this purpoſe, without the addition of any thing from without; and what we obſerve of the youngeſt foetuſes we can diſſect, having their ſtomachs full, (§ 30.) ſeems plainly to point out the ſource of the liquors there to be no other than the bowel itſelf. It would appear to me, that the contrivance of puſhing the blood in the deſcending aorta, with the united force of both ventricles of the heart (§ 10.) is in part deſigned to promote a greater ſecretion in theſe hollow viſcera, where the reſiſtance to the effuſion of the liquors will be leſs than in ordinary glands.

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† Apud Blaſ. anat. animal. p. m. 122.

7. THE quantity of mucus in the ſtomach and ſmall guts, and of the meconium in the great guts, (§ 30. 31.) is looked upon by ſeveral writers as a very convincing argument for the foetus's feeding on the liquor of the amnios; and, as a proof *a poſteriori*, they mention De Graaf's † example of a whelp brought forth without a head, whoſe ſtomach was empty, and in whoſe inteſtines there was found but a ſmall (modica) quantity of excrements. 'Tis alſo probable, that a circumſtance in the ſecond child, which Mr Calder deſcribes‡, may be made uſe of here, viz. That, having the paſſage from the ſtomach into its guts ſhut up, there was but a ſmall quantity of meconium in its great guts. For it may be ſaid,

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† De mulier. organ. cap. 15.

‡ Medical Eſſays, Vol. 1, Art. 14.

that De Graaf's whelp ſhews the ſtomach not to furniſh its own liquor, but to receive it from the mouth, and as well as Mr Calder's child had little meconium, becauſe the *liquor amnii* was not ſent down into the guts.

I am ſo far from thinking that the quantity of matter ordinarily contained in the ſtomach and guts of a foetus, is any argument for food being furniſhed from the amnios, that on the contrary it appears to me very ſtrong againſt that opinion; for it is not to be imagined that the meconium ſhould be the recrement of any proportion worth notice of the food it had during the whole nine months of gravidation, ſeeing there is ſcarce more meconium than what an infant, when it it is nouriſhed by the mouth after birth, paſſes of fœces in one day; and that the colour of the meconium evidently diſcovers the liquors ſecerned within the fœtus's body to compoſe the greateſt ſhare of it.

If De Graaf's whelp is applied to the uſe I have made of it, namely, to prove the ſtomach incapable of furniſhing any liquor, becauſe this one was found empty, it will certainly be allowed by every one to prove too much, ſince none can with any ſort of reaſon ſay, that the ſtomach ſecerns no liquor. But, leſt I would be ſaid to extend this example deſignedly to too general a concluſion, in order to elude the natural conſequence, I ſhall give my opinion of the fact as it is related. It is this, that I would blame a faulty diſpoſition in the veſſels of that whelp's ſtomach for its emptineſs, becauſe I ſhall ſoon give poſitive proof of the ſtomach's being capable of furniſhing the quantity of liquor commonly found there in foetuſes, without receiving any thing from the amnios.

It needs be no ſurprize that there were few excrements in Mr Calder's child, ſince the two great ſources of them were wholly or in part ſtopped. The ſtomach ſent nothing down, and the divided duodenum hindered the biliary and pancreatic liquors to paſs freely.

But, to overbalance theſe two examples, and indeed the general argument alſo by poſitive proof of the ſtomach and guts being able to furniſh their contents, which muſt be of more weight than any negatives can, I ſhall likewiſe mention two hiſtories; the firſt is, of the pig, which Dr Bellenger † deſcribes, brought forth with its mouth quite ſhut up, but having its ſtomach and guts full of the uſual contents. The other inſtance is rather ſtronger; for Mr Antoine ‡ found a glairy yellow liquor like to excrements in the ſtomach and guts of a lamb, that had neither head, heart, lungs, liver nor pancreas, which I hope will be convincing, that the meconium is no other than the groſſer parts of the liquors ſecreted in the alimentary tube, and of the bile and pancreatic juice.

Theſe are all the arguments of any weight that I know to be advanced for proving the paſſage of the *liquor amnii* into the ſtomach. In anſwer to which I have offered reaſons, which ſeem to me to turn them all in favour of the ſide of the queſtion oppoſite to that for

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† De foet. nutr. cap. 9,

‡ Hiſt. de l'Acad des ſciences. 1703.

which they were advanced; and therefore I muſt conclude this third problem, by aſſerting, "That "the *liquor amnii* does not paſs into the ſtomach "of a foetus."

The CONCLUSION.

SEeing then all the three problems are reſolved, with reſpect to viviparous animals, ſo as to favour the nutrition by the navel alone, allow me to ſum up all by a ſhort recapitulation of the arguments which I have inſiſted on at ſo much length.

The foetus being capable of receiving its whole nouriſhment by the umbilical vein alone, whereas none can ſubſiſt without the umbilical veſſels.-----The liquor of the amnios being ill calculated in its natural ſtate for the food of a foetus; and becoming ſometimes altogether unfit food in morbid caſes without the foetus being any way injured.-----It being highly improbable that a creature ſhould furniſh its food out of its own body, which muſt be the caſe if the foetus feeds on the *liquor amnii*.-----Seeing it cannot be inferred from any reſemblance of the liquors of the ſtomach and amnios, nor from any other appearances, that that of the amnios ever is ſent down into the ſtomach.-----Seeing no direct proof can be had of the *liquor amnii* being preſſed or ſwallowed down, but, on the contrary, all circumſtances make it probable that it does not go down.-----And ſince all the phaenomena of a foetus can moſt reaſonably be accounted for, without ſuppoſing the liquor of the amnios to be any part of its food. Is it not reaſonable, after all this, to exclude the mouth from the office of conveying the aliment of the foetuſes of viviparous animals, and to believe that all their nouriſhment is conveyed by the umbilical veſſels?

X. *The Sequel of the preceeding Eſſay on the Nutrition of* Fœtuſes, *by the ſame.*

I Come now to conſider "How far the nutrition of the foetuſes of oviparous animals, and of plants, ſerves to illuſtrate or confirm what has been argued for in the preceeding eſſay;" the plan of which I ſhall here follow; but beg to be excuſed, if, inſtead of mentioning only the facts immediately neceſſary, I take the liberty to give a ſhort hiſtory of an egg, and of the changes brought on it by incubation, with an abſtract of the formation and vegetation of the ſeeds of plants. My reaſons for taking in more facts than are juſt neceſſary, are, That ſeveral of theſe cannot be rightly underſtood, without a previous knowledge of others; and, in the next place, I have obſerved that ſuch an hiſtory of eggs and plants as I propoſe to give here is very little known, notwithſtanding accurate treatiſes have been wrote on theſe ſubjects, which I think may be attributed to their being treated of in a manner that requires more ſtudy than moſt people are willing to employ in picking out, from among the numerous particular examples theſe authors deſcribe, the facts neceſſary for compoſing an ordinary general ſyſtem, which is what I aim at here.

Of the Nutrition of the Foetuſes *of Oviparous Animals.*

TO ſave the perpetual repetition of my being aſſured of the truth of each fact by repeated obſervations, I ſhall advertiſe you once for all, that, unleſs where I expreſsly confeſs I had no opportunity, or neglected to examine them, you'll be pleaſed to believe, that I am obliged to give ocular demonſtration of what I aſſert.

1. THE ſhell of an egg becomes more brittle by being expoſed to a dry heat.

2. THE ſhell is lined every where with a very thin, but pretty tough membrane, which dividing at or very near to the obtuſe end of the egg, forms a ſmall bag, where only air is contained.

3. IN a new laid egg, this folliculus appears very little, but becomes larger when the egg is kept.

4. THE albumen or white of an egg is contained in concentrical membranes, but is not all of the ſame conſiſtence: For the exterior part of it is thin, and diffuſes itſelf almoſt like water, when the membranes are broke; whereas its interior part is more viſcous.

5. THE white of an egg can make its way through the ſhell, as appears from its waſting by keeping, eſpecially if it is expoſed to gentle heat.

6. THE globular vitellus or yolk would ſeem to be no other than a liquor, incloſed in a membrane, becauſe, whenever the membrane

is broke, it runs all out; and it is ſpecifically heavier than the white.

7. THE chalazæ are two white ſpungy bodies, riſing very ſmall from oppoſite ſides of the membrane of the yolk, but gradually become larger as they are ſtretched out from it in an oblique direction with regard to the two ends of the egg.

8. IF we compare the chalazæ to the extremities of an axis paſſing through the ſpherical vitellus, this ſphere will be compoſed of two unequal portions, its axis not paſſing through its center; conſequently, ſince it is heavier than the white (§ 6.), its ſmaller portion muſt always be uppermoſt in all poſitions of the egg.

9. THE yellowiſh-white round ſpot, called cicatricula, is placed on the middle of the ſmaller portion of the yolk; and therefore, by § 8. muſt always appear on the ſuperior part of the vitellus.

10. THE cicatricula ſeems to be compoſed of ſeveral circles of different colours, and in a fecundated egg contains the embryo or chick, ſee Malpigh. †.

11. EGGS, whoſe obtuſe ends are all rubbed over with lintſeed oil, or ſuch other ſubſtances as block up ſmall pores, are as fit for bringing forth chickens, when incubated by a hen, as other eggs are.

I did not make the experiment, but can give a voucher, whoſe ſcrupulous candor, with ſincere good wiſhes and endeavours for the im-

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† De ovo incubat.

improvement of phyſic in this place, ſome of you muſt be acquainted with, I mean my father, who beſmeared eighteen eggs in the manner mentioned; then having put a mark on them, he ſet them with the like number of other eggs, under three hens, who brought out thirty ſix chickens, not one egg of the whole number failing.

12. After *INCUBATION*, the *folliculus aeris* is gradually extended; till near the time of the excluſion of the chick, it occupies, as near as I could judge, ſome more than a third of the cavity of the ſhell.

13. The extended folliculus does not collapſe, upon being expoſed to the preſſure of the atmoſphere, after incubated eggs are opened †.

14. By incubation the albumen becomes thinner and more turbid, eſpecially on its upper part near to the air-bag, where it is alſo firſt conſumed: And it is afterwards diminiſhed towards the ſharp end of the egg, till at laſt nothing of it is left, except a white cretaceous ſubſtance at the lower part of the ſhell.

15. As the part of the white neareſt to the ci-

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† It is ſomewhat out of my ſphere to inquire how this additional air gets into the folliculus; but, if any are curious enough to make this inquiry, I would recommend to them to obſerve how this folliculus diſtends and keeps ſtretched in an exhauſted receiver of an air pump; to exhauſt the air gradually out of the ſhell, while it ſtands expoſed to the atmoſphere, both while the folliculus is entire, and after it is broke, obſerving always the riſing or falling of the mercurial gage. To conſider § 11. and 13. and to conſult Bellini, De mot. cord. Prop. ix. and Hale's Staticks.

cicatricula is waſted, its membrane and the cicatricula ſtill approach nearer, till they become contiguous. This membrane of the albumen is what is commonly called the chorion.

16. Some time before the albumen is quite conſumed, what remains of it is placed at the lower part of the egg; and therefore the yolk is interpoſed betwixt it and the membrane which imediately contains the foetus, (ſee § 9, and 10).

17. The white of a fecundated egg is as ſweet and free from corruption, during all the time of incubation, as it is in a new-laid egg.

I taſted, ſmelled, and ſwallowed the whites of eggs during all the ſtates of incubation, both when they were raw and boiled, and conſtantly found it as juſt now deſcribed; and therefore cannot imagine how Bellini † could affirm it to have a heavy, abominably-ungrateful taſte, a ſtinking ſmell, and not only to occaſion, when ſwallowed, a troubleſome ſenſation in the ſtomach and guts, but to prove purgative. He muſt unluckily have examined none but ſubventaneous eggs; which is further confirmed by his deſcription of the ſmall particles in the colliquated albumen, that reflect light ſo ſtrongly as the eye cannot bear it; which I ſaw in ſome ſubventaneous eggs, but could not obſerve in any that were impregnated.

18. According to Bellini ‡ the colliqua-

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† De mot. cord. prop. vi.

‡ Ibid.

ted white always becomes uncapable of coagulation by heat; but, in the trials I made, it frequently did coagulate, though I found the ſucceſs of this experiment very uncertain; the only general rule I could fix was, that, before the 9th or 10th day of incubation, the thinner white did not generally coagulate, but after that it frequently did.

19. VERY ſoon after incubation, the volume of the yolk appears increaſed, and, by its riſing then nearer to the upper part of the egg, one may conclude that its ſpecific weight decreaſes.

20. THE yolk becomes pale and more fluid for ſome time, eſpecially on the ſide next to the chick, where its bulk alſo ſooneſt increaſes; but afterwards the membranes of the yolk turn firmer and ſtronger, and the liquor in them is leſs in quantity, and becomes more viſcous.

21. As the chick increaſes, the yolk is depreſſed in the middle, and is ſoon brought into a form ſomething like to a horſe-ſhoe, in the middle of which the chick is lodged.

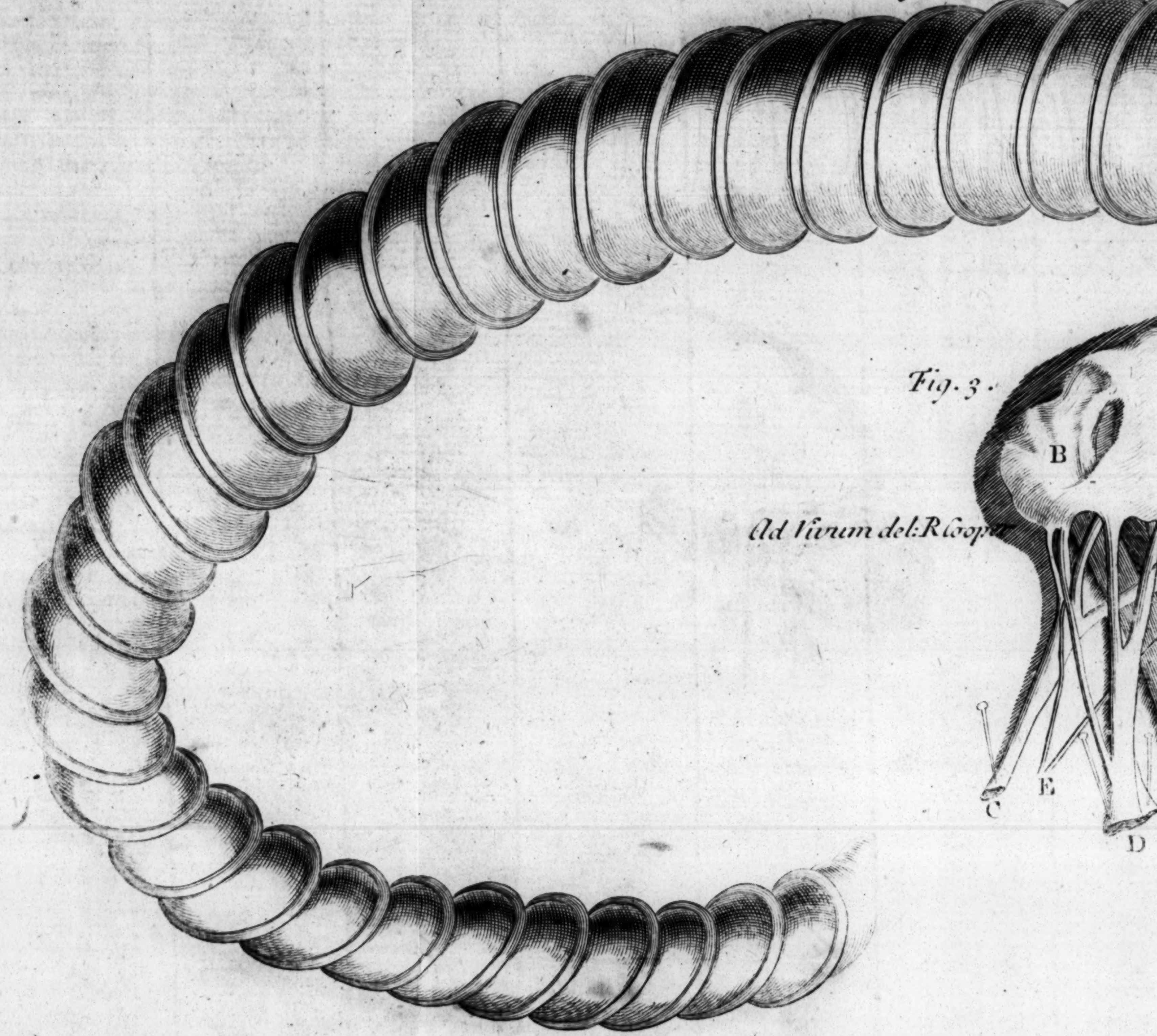
22. THE yolk remains freſh and uncorrupted all the time of incubation, and is always coagulable.

23. NOT long before the excluſion of the chick, the whole yolk is taken into its abdomen.

24. THE whole albumen and vitellus are not conſumed by the chick; for ſome part of the humours of the egg eſcapes through the ſhell, and is not ſupplied by any thing from without, as evidently appears by an egg's becoming ſo much ſpecifically lighter, as to ſwim in wa-

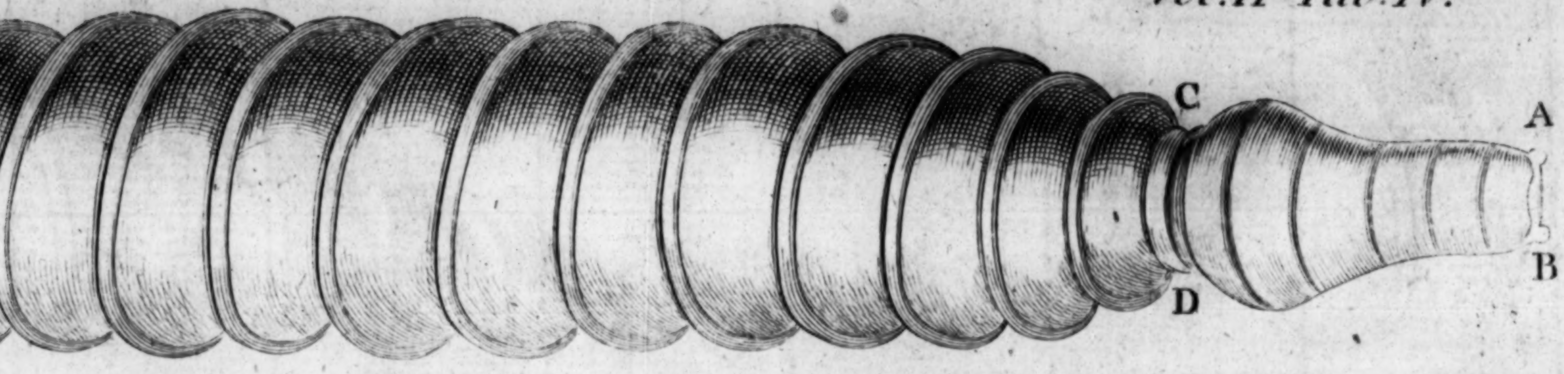
Fig. 1.

Fig. 3.



Ad Vivum del: R Cooper

Vol. II Tab. IV.



Ad Vivum del: G. Robertson

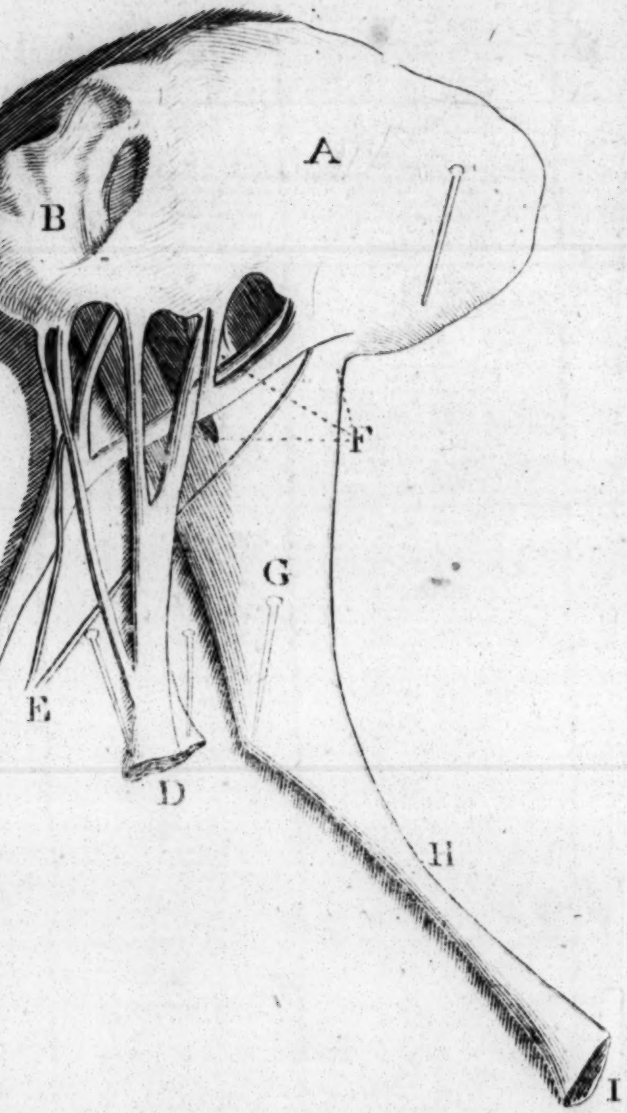
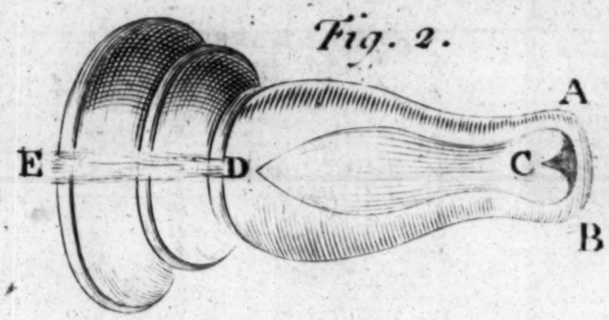


Fig. 2.



R. Cooper Sculp.

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ater after incubation, though it ſunk in it hen recent.

25. THE chalazæ remain long without be-ng conſiderably changed, unleſs that they are rought nearer to each other by the creſcent orm of the yolk, at laſt they degenerate into a lry chalky ſubſtance.

26. THE cicatricula very ſoon is enlarged by ncubation; and, being buoyed up on the top f the yolk, to the ſuperior part of the egg, t is placed very near to the air-bag; and, when oth encreaſe, they become contiguous.

27. THE cicatricula is called amnios, when t becomes large, and contains the colliquamentum, or liquor in which the chick is immerſed.

28. THE quantity of the colliquamentum gradually increaſes till the 15th or 16th day of ncubation; on the 18th, it is all conſumed; and, n the three following days, ſcarce any moiſture can be obſerved on the internal ſurface of the amnios.

29. THE liquor of the amnios is more clear and tranſparent than the colliquated white; its taſte is more ſalt, and it has no obſervable ſmell. Its conſiſtence is at firſt a little viſcous, then it becomes more fluid, and afterwards turns a little ropy again.

N. I can ſay nothing of the particular times when it does or does not coagulate by heat; for it is in ſo ſmall quantity, during the greater part of the time of incubation, that one can ſcarce gather as much in a ſpoon as is fit to make any experiment with; and when all the egg is boiled hard, it adheres ſo cloſely to the white, that it is ſcarce poſſible to diſtinguiſh one from the other. Malpighius [*], ſpeaking of the egg between the 14th and 19th day, ſays, "That this thin diaphanous liquor of the amnios was ſometimes forced by boiling into a white taſty ſubſtance," which my trials alſo confirmed.

30. The allantois and its contained urine are to be ſeen in an egg, as well as in the ſecundines of viviparous animals. [†]

31. Tho' the heart is among the firſt parts of the chick that can be diſtinguiſhed, yet the umbilical veſſels are ſeen much about the ſame time that the heart is obſerved.

I did not inquire into this fact, but have two very good vouchers for its truth, Harvey [‡] and Malpighius [‖].

32. The umbilical veſſels gradually diſperſe their branches upon the amnios, upon the vitellus, and upon the membranes of the albumen: The extremities of their much greater number, being immerſed into the white, are extended proportionally as it is colliquated.

33. Near to the end of incubation, the umbilical veſſels begin to ſhrivel and decreaſe, till at the excluſion they are very ſmall.

34. The embryo is ſeen in an egg at firſt in form of a ſmall worm, then its carina or ſpine, with the large prominencies that afterwards ſhew themſelves to be the brains and eyes, appear; the other bowels ſeem hanging from the ſpine, the chaſm of the mouth diſcovers

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[*] De ovo incubato.

[†] Malpig. Append. de ovo incub. Tab. vii.

[‡] De generat. animal exercit. 16. and 17.

[‖] De ovo incubato.

itſelf; the extremities ſprout out; the viſcera are gradually covered with the teguments; and at laſt the beak, nails, and feathers are ſeen: After which all the parts become ſtronger and firmer, the proportional bulk of the head decreaſing.

For the particular times when all theſe changes are thus orderly brought about, conſult Fabric. ab Aquapendente, Harvey, and Malpighius.

35. After all the parts of the chick are formed, it is always found lying on its ſide, with its neck greatly bended forward, the head being covered with the upper wing, and the beak placed between the thighs.

36. When the ſhell is opened after the chick is large and ſtrong, it may be ſeen to bounce and ſpurn, ſometimes opening its mouth wide, eſpecially if it is ſtirred or pricked.

37. The mouth, oeſophagus, and ingluvies are always found moiſt, but never contain any quantity of liquor that can be collected or will run out in drops.

38. The bulbous glandular part of the oeſophagus immediately above the ſtomach, or what Peyer † calls the infundibulum, and the ſtomach, are full of a liquor, in the youngeſt chick we can diſſect, and continue full the whole time of incubation; neither infundibulum nor ſtomach having yet got the tendinous firmneſs they have in adults; nor can we obſerve the dry pellicle which is ſo eaſily ſeparated from theſe parts in hens.

39. This liquor of the ſtomach is at firſt

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† Comment. in anat. ventricul. gallin.

thin and more watery; afterwards it becomes curdy, and at laſt is all in form of a greyiſh white mucus, unleſs that ſome part of it frequently is coloured yellow or green, by a mixture of bile. It always coagulates by boiling, into a firm yellowiſh white ſubſtance.

40. THE quantity of foeces was not large in the great guts, of any chickens I opened before excluſion.

41. A little time before the excluſion, the chick may frequently be heard, making the ſame pieping ſound that hatched chickens make. In three eggs, which were all I opened in this ſtate, the beak of the chick had perforated the membrane of the *folliculus aeris*.

42. THE ſhell at the obtuſe end of the egg frequently appears cracked ſome time before the excluſion of the chick.

43. THE chick is ſometimes obſerved to perforate the ſhell with its beak; but, in thoſe I ſaw tumbling out of the ſhell, it was broke off irregularly, at the place where the membrane of the *folliculus aeris* was joined to it.

44. AFTER the excluſion of the yolk is gradually waſted, being conveyed into the ſmall guts by a ſmall duct; its membranes gradually contract themſelves, and the duct becomes ſhorter. On the tenth day after excluſion, the vitellus was no larger than a ſmall pin-head, and the duct was ſcarce one twentieth part of an inch long.

From this hiſtory of the egg and of incubation, I ſhall endeavour to deduce the manner in which the colliquated white is taken in by the chick.

Authors generally ſeem to agree, that the oviparous foetus, while very young, receives its nouriſhment by the navel; but ſeveral of the beſt reputation have been of opinion, that afterwards it is conveyed by the mouth. I ſhall examine the arguments they uſed in proof of this, and then ſhall ſubjoin ſome negative reaſons which they have not taken notice of.

Bellini † has deſcribed the cicatricula or *ſacculus amnii* with the chalazæ firſt formed in the back of the hen; to which, according to him, the vitellus is afterwards joined, and the white is acquired as they tumble down the oviduct. He ſays the chalazæ are compoſed of numerous canals which open into the amnios, and ſend out their roots into the cavity of the yolk, and into the white. It is eaſy to conceive what conſequences may be drawn from this deſcription, by thoſe who aſſert the nouriſhment to be carried by the mouth, viz. That here are direct paſſages into the cavity where the chick is, which can take up the liquors no other way than by the mouth.

The anſwer to this obſervation is the ſame as has been made to the other facts already quoted from this author. I deny that the *ſacculus amnii* is formed before the vitellus; on the contrary, the vitellus is evidently to be ſeen before the cicatricula or chalazæ can be diſcerned. Next, I deny the chalazæ (if they are canals) to have the leaſt communication with the amnios, at any time, or in any ſtate of the egg, otherwiſe than as they are both adhering to

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† De mot cord. prop. ix.

to the membrane of the vitellus, upon which, or within which, no particular fibres, no canals are ſtretched to the cicatricula. Every one has it in his power to examine theſe facts. If then the facts are denied, the conſequences cannot be admitted.

Since there are no canals paſſing through the yolk, that open into the *ſaccus colliquamenti*, and the cicatricula comes to be placed on the upper part of the yolk, and contiguous to the air-bag, § 26. it is evident, that the *liquor amnii* muſt be furniſhed by the chicken, which being covered with feathers, having no mammæ, bladder of urine, or large ſalivary glands, can only ſupply it by the branches of the umbilical veſſels ſpread on the amnios.

Harvey † affirms, that a liquor is found in the mouth and ingluvies of the chick, which he concludes to be the colliquamentum or *liquor amnii* from their reſemblance; from the quantity of the contents of the ſtomach; from the chick's being ſeen to open its mouth; and from the neceſſity creatures are in of ſwallowing, or of forcing back by vomiting, whatever is introduced to the root of their tongue.

As to the reſemblance, I do not ſee how the compariſon can be made, ſeeing the liquor in the mouth and crop is in ſuch ſmall quantity, § 37. But ſuppoſe that a ſufficient quantity was collected, the two liquors agreeing in ſeveral properties would not of itſelf be a ſufficient proof of their being the ſame; and if, for argument's ſake, the liquor in the crop was granted to be in very large quantity, and to agree in every property with that in the amnios, it would certainly appear in the ſame form for ſome time in the ſtomach, whereas it is always found very different there in the larger foetus, § 39. and Harvey confeſſes as much in this place; therefore it may be concluded, that it does not go down into the ſtomach.

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† De generat. animal. exercit. 58.

If ever any thing like foeces has been ſeen in the crop of chickens, as has been alledged by ſome, it might be no more than the yellow or green-coloured ſubſtance brought up from the ſtomach, § 39.

The quantity of the contents of the ſtomach and inteſtines may be accounted for from § 38. applied to what was ſaid on viviparous animals.

Though creatures that reſpire are under a neceſſity of either ſwallowing, or forcing back by vomiting, whatever is introduced beyond their fauces, I cannot think it ſhould be thence concluded, that a foetus is under the ſame neceſſity; for, as it does not exerciſe reſpiration, it will ſuffer no inconvenience by a liquor lodging near to the glottis; whereas creatures that breathe cannot allow any ſubſtance to remain there without danger of the glottis being ſtopped, or of ſuch ſubſtances falling down the trachæa, either of which would be of bad conſequence; which the creature prevents, by forcing ſuch ſubſtances out of ſuch a dangerous ſituation.

But, to enforce the negative of the colliquamentum paſſing by the mouth, obſerve, that there are only three days in which this paſſage can moſt probably be ſuppoſed to happen, which are from the fifteenth to the eighteenth day of incubation; for, before the fifteenth, the quantity of the *liquor amnii* is increaſing, which is no great ſign of its being ſwallowed; and after the eighteenth this liquor is not to be ſeen, vid. § 28. If then the *liquor amnii* were all ſwallowed between the fifteenth and eighteenth days, the ſtomach ought to be fuller at this time, and its contents ſhould be thinner, more pellucid, &c. like to the colliquamentum; which I aſſure you does not happen. Beſides, if we ſuppoſe the power of digeſtion ſo ſtrong as to expell this liquor as faſt as it is taken down in theſe three days, it would certainly follow that this powerful digeſtion, continuing in the three ſucceeding days, while there is no liquor to be ſwallowed, the ſtomach ought to be quite emptied, which every one, who opens the ſtomachs of chickens at this time, will ſee it is not. And, laſtly, as a more direct proof ſtill againſt Harvey, I broke the ſhells of ſeveral incubated eggs, while the colliquamentum was in large quantity; and, before the amnios was opened, I ſaw the chickens open their mouths very wide ſeveral times, but could not obſerve the quantity of the liquor in which they lay any way leſſened. I afterwards carefully diſſected the chickens, and found no other than the common ſmall quantity in the crops, and the ordinary curdy mucus in the ſtomach, which ſeems to me a demonſtration that they do not ſwallow.

After ſuch convincing proofs, it will be needleſs

leſs to make any application of the arguments in the former part of this eſſay to this ſubject; and therefore I ſhall only deſire your readers to compare the poſture of a chick, and of a hen while ſhe ſwallows liquors, that they may ſee the poſture of the chick's neck to be moſt unfavourable to the ſuppoſition of deglutition being performed; and then ſhall conclude with a very ſhort hiſtory of incubation, aſſigning what I imagine to be the moſt probable reaſons of the ſeveral appearances.

By the heat of the hen, or of ſtoves equal to it, aſſiſted poſſibly by the action of the air contained in the *folliculus aeris*, (§ 2. 3. 12.) the albumen becomes thinner, eſpecially where it is moſt expoſed to theſe forces, (§ 14.) and the vitellus in the ſame manner becomes ſpecifically lighter, (§ 19.), and therefore readily riſes in the white; and as, by being divided into two unequal portions by its axis the chalazæ, it preſents the ſmaller portion to the incubating heat at firſt, (§ 8. 9.) ſo the change in conſequence of incubation being ſooneſt and moſt produced here, (§ 20.), and, the cicatricula being enlarged at the ſame time, the ſmaller portion of the yolk becomes of the leaſt ſpecifical weight; and therefore is buoyed up to the ſuperior part of the egg, whereby the *folliculus aeris*, and membranes of the cicatricula become contiguous when they enlarge, (§ 26.) and the vitellus can never be in hazard of compreſſing the tender embryo; and the umbilical veſſels are ſituated ſo as to have their extremities immerſed in the liquors, that firſt undergo the proper change, for being imbibed

by

by their orifices, (§ 32.)----The incubation continuing, the white is ſtill more and more colliquated, and the umbilical veſſels are proportionally extended, the veins to abſorb it, and the arteries to throw out any particles that are unfit for the chick till they are farther prepared, but eſpecially to drive forward the liquors in the veins, as was explained in the account of the viviparous animals, (§ 20.)----When the white in the upper part of the egg is exhauſted, its membranes become contiguous to the amnios, (§ 15.) and thereby the membranes, involving the foetus, become ſufficiently ſtrong to reſiſt the motions of the chick, when its eaſe or ſafety prompt it at any time to ſpurn.------The powers of incubation above mentioned, aſſiſted by the pulſation and conquaſſatory motions of the numerous umbilical veſſels ſpread on the yolk, (§ 32.), diſſolve that humour more, and render ſome part of it fine enough to be taken up by the ſmall extremities of the umbilical vein, ſome of which penetrate its membrane; By which the liquor at laſt becomes thicker, (§ 20.) and the membrane being in part emptied, will more eaſily yield to the weight of the chick; and is preſſed into the form of a horſe-ſhoe, (§ 21.) while the net-work of veſſels extended on this membrane render it ſtronger and firmer.-----The *folliculus aeris* not only aſſiſts in colliquating the albumen; but, when the humours of the egg come to occupy a leſs ſpace, by eſcaping through the ſhell, (§ 24), and by being changed into the ſolid ſubſtance of the chick, the folliculus enlarging, (§ 12.), keeps the chick and humours ſteady, without danger of being diſordered and broke by the motions of the egg.——Branches of the umbilical veſſels being diſtributed to the amnios, (§ 32.), the arteries will pour out their liquors into its cavity in greater quantity than the veins can take them up, as long as the fœtus is weak; but, whenever the fœtus becomes ſtronger, and conſequently, the abſorbent power of the veins increaſes, (vid. § 15. of former eſſay), they will take up the fluid of the amnios faſter than the arteries pour it in, and its quantity will be diminiſhed till it is quite exhauſted, (§ 28. and 29.)——This abſorption will go on more ſpeedily in proportion alſo to the umbilical veſſels being leſs diſtended with albumen, whereby there is leſs reſiſtance to the progreſſive motion of the abſorbed liquors; which probably is the reaſon of the colliquamentum being all taken up between the fifteenth and eighteenth days.——By the conſtant circulation and renewal of all theſe humours of the egg, they keep freſh and uncorrupted in a fecundated egg, (§ 17. and 22.), but corrupt ſoon in a ſubventaneous one, or in ſuch whoſe foetus dies in the time of incubation.——Wherever veſſels are not ſufficiently filled, they contract themſelves; and therefore, the albumen being exhauſted in the laſt days of incubation, the umbilical veſſels gradually ſhrivel, (§ 33.), which prevents the danger of an hæmorrhage when the chick is ſeparated from its membranes. But, as the white is not ſufficient at this time fully to ſupply the chick, the yolk is taken into its body, (§ 23.), and being there preſſed, it is thrown gradually by the proper duct (§ 23. and 44.) into the guts, to ſupply that defect.——The veſſels and glands which open into the alimentary tube ſeparate at leaſt as much liquor as will moiſten it; and, the ſtomach having no callous ſtrong cruſt on its internal ſurface, (§ 38.), will ſeparate more than it can do in the adult; and in the mean time the glands of the infundibulum pour out a liquor that is always thicker as the chick increaſes, till it becomes a very thick white mucus: And therefore the contents of the ſtomach of the foetus in the egg muſt have the appearance deſcribed § 39. and will be ſlowly paſſing off into the inteſtines.——The ſhell at the obtuſe end of the egg becoming more brittle, by being ſo long expoſed to a dry heat (§ 1.), and the membranes loſing their toughneſs when their moiſture is exhauſted, the chick very eaſily tears them, and breaks off that end of the ſhell, to make its way into the common atmoſphere.——The mother having no juices prepared within her body, to give the chick for food after it is hatched, and its organs for taking in and digeſting aliment being, for ſome time, too weak to ſupply it ſufficiently with nouriſhment, the vitellus is made to ſupply theſe deficiencies, till the chick is ſufficiently confirmed and ſtrong, (§ 44.), after which it is no longer the ſubject of my preſent inquiry.

Of the Nouriſhment of Plants while in a Fœtus State.

THE firſt eight numbers of the following facts are taken from Mr Geoffroy *, and all the others, except one or two obſervations of my own, are collected from Malpighius †.

1. Flowers contain the male and female organs of generation of plants.

2. The male organs are ſmall bladders, (the apices) full of a very fine duſt, each particle of which is of a particular diſtinguiſhed form in each ſpecies of plants.

3. When this duſt or farina is ſufficiently ripe, the bladders break with an elaſtic force, and throw the duſt from them.

4. The female organ is the ſtylus, piſtillum, or tuba, conſiſting of ſeveral canals, which are open and wide at one extremity; but, in the other neareſt to the ſtalk of the plant, terminate in one or more cavities where ſmall roundiſh ovula are contained.

5. Both organs of generation are contained within and protected by leaves of different make and colour in different plants, which leaves are generally called the petala of flowers.

6. Some flowers contain both the male and female organs, and therefore are called hermophradites; others only contain one or the other

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* Mem. de l'Acad. des ſciences, 1711.

† Anat. Plant. cap. de ſeminum generat. & in tractat. de ſem veget.

ther kind, and thence are named male or female.

7. Thoſe flowers which are only male or only female, either grow both from the ſame root, or the male only grow on one plant, and the female upon another of the ſame ſpecies; from which ſuch plants are ſaid to be male or female.

8. When the male farina, or duſt, is prevented from having acceſs to the female organs, either the ovula do not increaſe into ſeeds, or, if they do grow, they are deformed, do not contain any germ or rudiment of the young plant, and are not prolific.

9. When the fecundated ovula increaſe, the germ or young plant of each is ſeen lodged in a pulpy ſubſtance named the *ſeminal leaves*, which again adhere to, and frequently are ſunk ſome way into a depreſſion of a membrane, which forms a little bag for containing a liquor; and therefore this bag is called the amnios.

10. From this ſide of the amnios, oppoſite to that where the germ, with its *ſeminal leaves* is fixed, a tube (the umbilicus) goes out to be continued to the uterus.

11. Before the umbilicus reaches the uterus, it paſſes through a cavity formed by another membrane that is full of liquor, or contains a great number of ſmall veſicles diſtended with liquor, and therefore is compared to the chorion.

12. The chorion and amnios become more and more turgid with liquors for ſome time, but then the liquors begin to diminiſh, the

chorion being ſooneſt emptied, and the navelſtring ſhrivels away till it can no longer be obſerved.

13. In the mean time the germ and ſeminal leaves increaſe apace.

14. At laſt all the liquors in the chorion and amnios are conſumed, their membranes contract and ſhrivel, the ſeed is ſufficiently large and confirmed; the ſmall peduncle, by which it adheres to the uterus, ſhrivels, turns hard and brittle, and the ſeed falls off with the leaſt force.

15. The ſeed is compoſed of its membranes or teguments, of a large farinaceous part, and of the ſmall germ joined to the farinaceous ſubſtance by a ſmall peduncle, which is inſerted into the germ between the caulis, ſtalk, or plume, and the radicle or ſmall root of this young plant.

16. The germ is evidently the young plant where the plume and root may plainly be ſeen.

17. When the fecundated ſeed is ſowed at the proper ſeaſon, the farinaceous ſubſtance ſoon becomes ſofter, and the germ ſtretches its ſtalk upwards, and its root downwards.

18. The farinaceous ſubſtance either remains under ground, turning larger for ſome time, but having its ſubſtance changed more and more into a milky liquor, or it is extended upwards in form of one or two pulpy juicy leaves: From theſe different forms which this farinaceous ſubſtance takes, it is called the cotyledons, ſeminal leaves, or lobes.

19. After ſome time the lobes begin to ſhrivel, and to have their liquors conſumed,

and at laſt, when their juices are all waſted, they fade away and fall off.

20. The plant grows very faſt all this time.

21. When the cotyledons are taken off before the plants are put into the earth, ſcarce any of them will vegetate, and all periſh very ſoon.

22. Thoſe that advance any, after being thus deprived of their cotyledons, increaſe rather in their plume than root.

23. When the ſeminal leaves are taken away, after allowing the plant to vegetate ſo far as to come above ground, it periſhes in a little time, the roots generally fading firſt.

24. If the cotyledons are taken away later, moſt of the plants die, and thoſe that continue to grow are always very ſmall.

25. When one cotyledon is only taken away, the plants do grow, but are not near ſo large or ſtrong as the others that are left entire.

26. By taking away the plume, when it firſt ſprouts above ground, the roots grow very large and quickly.

To fix an analogy here between animals and plants, it will be neceſſary to determine how long either of them ſhould be ſaid to remain in the ſtate of a fœtus, which, in my opinion, ought to be underſtood ſo long as the young creature is nouriſhed ſolely by liquors furniſhed by the uterus of the parent; but as ſoon as it is ſupplied any other way, with all or any part of its nouriſhment, it can no longer be looked on as a fœtus.

If this is agreed on to be the diſtinguiſhing character of a fœtus, it will be evident that we are only to regard plants as fœtuſes, while the ſeed is ripening, and before the earth, water, moiſture of the air, &c. have communicated immediately any matter for its increaſe; and in this caſe it will appear moſt probable, that the umbilicus pours in liquors from the uterus and chorion into the amnios, from which it is taken up by the veſſels of the ſeminal leaves, to be conveyed partly into the fœtus, and partly into the leaves themſelves, by which the plant is increaſed and its parts are explicated, and a ſubſtance is provided for nouriſhing it afterwards, when its tender roots either can receive from the earth very little, or any thing leſs than is neceſſary for the ſufficient growth of the plant.

In running this analogy between animals and plants, you'll obſerve a mixture of the mechaniſm of the viviparous and oviparous animals in the nouriſhment of the fœtuſes of plants; for the little plant having, as in the viviparous animals, a communication with the uterus of the parent till it is fully formed, the whole quantity of the liquor it is to be nouriſhed with, is not at firſt to be ſeen, as the albumen is in the egg; but the uterus furniſhes the liquor to be gradually abſorbed by the cotyledons or placenta: And then, on the other hand, plants reſemble the oviparous animals, in ſo far as the parent being uncapable of ſupplying any juices, prepared in its own body after the fœtus is ſeparated from the womb, for the nouriſhment of the plant; and the young plant not being in condition for ſome time to ſubſiſt entirely on the new nouriſhment it muſt receive; the farinaceous cotyledons, or pulpy ſeminal leaves do the ſame good office to the plant, as the vitellus does to the chick after it is hatched.

Since the reſemblance is ſo great between animals and plants, it would be ſuperfluous, after what has been ſaid of the former, to enter into a particular detail of the reaſons of the foregoing phænomena of plants; and it is almoſt needleſs to ſay that I would conclude both the oviparous animals and plants to favour my opinion of the whole nouriſhment of all fœtuſes being conveyed by particular abſorbent veſſels, and not by the ordinary canals, through which the aliment muſt paſs, after the creature is out of its fœtus ſtate; for theſe are obvious to any who reads theſe eſſays with the leaſt attention.

XI. *Practical Corollaries from the Eſſay on the Nutrition of the Fœtuſes of viviparous Animals, by the ſame.*

BEING conſcious to what length the eſſay on viviparous animals had run out, I did not intermix any account of morbid phænomena with the deſcription of the parts, or with the arguments concerning the nouriſhment of the fœtus, which alſo would have had the bad effect of diverting the reader's attention from the principal deſign; but, conſidering how much ſuch phænomena may ſerve to explain, and poſſibly confirm, ſome part at leaſt of my reaſoning; and knowing how ill any thing that is not practical goes down with ſome people, I beg to be ſtill further indulged, while I bring a few examples to ſhew that the knowledge of the ſtructure of the parts is abſolutely neceſſary for underſtanding the nature of diſeaſes; and that all theory is not mere idle ſpeculation, but that reaſon and experience united, lay the ſureſt foundation of the practice of phyſic, (See Art. XXV. of firſt volume.)

I. SEEING the veſſels of the womb and of the placenta do not anaſtomoſe, (§ 16.), and women have an erect poſture, and are ſubjected to periodical evacuations from their uterus, which has larger canals opening into it than are to be obſerved in other animals, (§ 2. 3. 4. 5.), we may underſtand how much more liable women are to ſuffer abortions, than the females of other creatures are; for the contents of the impregnated human uterus preſs more on the orifice of the womb to force it open, the ſuperfluous quantity evacuated periodically at other times, is apt to thruſt off the placenta, and being poured into the cavity of the womb, either corrupts there, or forces open the *os uteri*; both which will probably occaſion the loſs of the fœtus: Whence women much more ſeldom conceive immediately before the menſes are to flow, than ſoon after that evacuation is paſſed. Thence alſo we underſtand why looſening, as the women call an appearance of blood from the uterus, is a ſymptom that diſcovers great hazard of abortion.

II. NATURE endeavours to provide againſt the inconveniencies mentioned in the preceeding paragraph, by making the placenta adhere ſooner to the human womb, than is ordinary in other creatures; and by furniſhing the human fœtus with a larger proportional placenta, whereby the adheſion is ſtronger, and on both accounts the evacuation is prevented.

III. When there is the largeſt quantity of the ſuperfluous liquors collected, the ſtrongeſt puſh muſt be given to ſeparate the placenta from the womb; but the menſes are generally ſtopped after pregnancy, and the child is too ſmall for ſome months to conſume them; wherefore women are moſt expoſed to abortions in the third or fourth month of their going with child.

IV. We ſee what diſorders are brought frequently on women at each period when their menſes are about to flow, and what miſchiefs almoſt conſtantly attend their obſtructions; and therefore need not be ſurpriſed at the fainting, nauſeæ, reachings to vomit, &c. that ſo often attack women in their firſt months of pregnancy, ſome of which help to remove and prevent other diſorders; for, by the vomiting, for example, not only an evacuation is made, but leſs chyle muſt be ſent into the blood-veſſels, which therefore will have leſs of the ſuperfluous liquors. This again teaches us to remove or mitigate ſuch ſymptoms when they become very violent and dangerous, by proper evacuations.

V. Since the ſeparation of the placenta from the womb muſt ſo evidently produce abortion, we may ſee that this may be occaſioned by very different cauſes, operating in various manners, and requiring very different treatment in preventing the loſs of the fœtus, when our advice is aſked timely.

1. Whatever occaſions too great a quantity of blood to be ſent to the uterus, or aſſiſts or increaſes its momentum to thruſt off the placenta; ſuch as plentiful living, compreſſion of other large veſſels, frights, violent exerciſe, ſhocks of the body, fevers, &c. will bring a woman into danger of abortion. The cure however is plainly pointed out, to wit, blood-letting, mild food in ſmall quantities, and reſt.

2. When the adheſion of the placenta to the womb is too weak, and the *os uteri* does not make a ſufficient reſiſtance to its own dilatation, whether theſe depend on the ordinary general conſtitution of the body, or on a particular diſpoſition of the womb, or on a ſudden relaxation, as in fainting, the ſame bad effect, abortion, may ſtill follow; but the cure muſt be very different from what is to be uſed in N. 1. For here we muſt rely on corroborants; and though much exerciſe is at firſt to be ſhunned, yet, if the patient can by degrees be brought to bear moderate exerciſe, it will aſſiſt the other medicines conſiderably.

3. If the ſinuſes of the womb are allowed ſuddenly to collapſe, by the want of a large enough quantity of liquors to diſtend them, as by the neceſſary ſupplies to the blood being with-held, or by violent evacuations, eſpecially loſs of blood, not only the weakneſs mentioned in Numb. 2. may follow; but the

veſſels of the placenta, which have not been proportionally emptied, will be diſengaged from the excretories of the ſinuſes, by their being deprived of ſufficient ſpace to lodge in, and there is great danger of abortion. In ſuch a caſe we are to be on our guard not to apply ſmart ſtimulants to rouze the languid mother too haſtily; for ſuch medicines increaſe the contraction of the veſſels of the uterus, and will drive off the placenta ſoon; but we ought to repair the quantity of her blood by mild balmy food, with a mixture ſometimes of the leaſt irritating cordials.

4. All cauſes that can produce a ſtrong contraction of the fibres of the uterus, or of the parts that can preſs upon it, as, for inſtance, of the diaphragm and abdominal muſcles, will be in danger of forcing away the placenta, and of opening the *os uteri*, whereby abortion is occaſioned. Therefore ſharp pains in any part of the body, and eſpecially in or near to the uterus, rough emetics, ſharp acrid purges, teneſmus, ſtrangury, piles, or ſuch like, are every day bringing on abortion. The radical cure is certainly to remove the cauſe of the pain or irritation, which muſt be done by medicines adapted to its particular nature and ſeat, which are too numerous to be mentioned here. If this cannot be executed ſo ſoon as we would deſire, we are to leſſen its bad conſequences as much as poſſible, by blunting its violence, and counteracting its effects. The firſt of theſe indications will principally and moſt ſpeedily be purſued in moſt caſes, (except perhaps in the inflammatory ones) by gi-

ving opiates. The ſecond intention is anſwered by diminiſhing the momentum of the blood, which venæſection effectually does, and is always uſeful in the inflammatory caſes; but is not ſo proper in ſome other circumſtances, where however the opiates generally anſwer our intentions.

VI. The liquors ſent into the foetus by the umbilical vein not having their propelling force communicated from the mother (§ 16.) the ſtate of the mother's pulſe cannot affect the child otherwiſe than by the occaſioning abortion, or vitiating the fluids that are to be abſorbed; and therefore we may be convinced, how vain it is to pretend to account, in a phyſical way, for the impreſſions ſaid to be made on children by the imaginations of the mothers. We may hence alſo ſee, that children may be infected with the diſeaſed juices of the mother, but that it is poſſible for them to eſcape catching the diſeaſes of their mothers, if either they are only topical, without affecting the whole maſs of fluids, or even when the mother's blood is ſpoiled, the child may be free of her diſeaſe, if the morbid particles are ſuch as the placentary veſſels cannot abſorb. This you ſee is in ſome ſenſe giving the veſſels a power of chuſing good or bad.

VII. The placenta is largeſt proportionally in the youngeſt foetuſes (§ 18.), by its being leſs capable of yielding to the ſtretching power of the contents of the uterus, than the membranous parts of the ſecundines are; and thereby it is better calculated for the greater proportional growth of the foetus when young.

VIII. Tho' the ſurface of the placenta is not extended proportionally to the increaſe of the foetus, yet the orifices of the ſinuſes ſeem to keep up to that proportion (§ 5.); therefore the ſurface of contact between the uterus and placenta rather decreaſes than turns greater; and a greater quantity of fluids is applied to that ſurface. Which may be one reaſon why the after-burdens of ripe children are brought away more eaſily than thoſe of abortions.

IX. By being acquainted with the muſcular ſtructure of the uterus (§ 6.), we come to know how the placenta ſeparates more eaſily after the child is born, than while it is yet contained in the uterus; for, as long as the child remains there, the womb is hindered to contract, upon which, and the want of a muſcular contraction in the placenta, the ſeparation of the after-burden depends. And ſince the degree of contraction of the uterus will be proportional to the diſtraction of its muſcular fibres, as happens in all muſcles, we may ſee another reaſon why the after-burdens of abortions are more difficultly brought away than thoſe of ripe children; and we may obſerve, how reaſonable the uſe of *pulv. ad partum*, or other cordial ſtimulating medicines, is, in ſuch caſes, to haſten this contraction, when there is not ſome ſtronger contra-indication, ſuch as fever or inflammation, to forbid their uſe.

X. The ſinuſes of the human womb (§ 3.) are much more ſafe and uſeful than any continued arterious canals could have been: For theſe would have occaſioned too great an hæmorrhage when the placenta was ſeparated; whereas, as, in the way the ſmall branches of the arteries are diſpoſed upon the membranous ſides of the ſinuſes, they muſt be compreſſed as ſoon the uterus contracts, and at the ſame time the reſiſtance, which the womb occaſioned to its own returning blood, by its preſſure on the large veins, being taken off when the womb collapſes, the lateral branches of the minute arteries can be very little diſtended with blood, and the ſinuſes will be very little filled. To illuſtrate this, remark a very analogous caſe, the œdematous ſwellings of the legs in women with child, which go off as ſoon as they are delivered. Hence we may be convinced, that the only means whereby we can ſave a woman's life, whoſe placenta ſeparates before birth, is to deliver her immediately. And hence it is plain, why the lochia or cleanſings gradually diminiſh in quantity, and loſe their red colour.

XI. SEEING the reſiſtance to the blood in the deſcending aorta is taken off upon delivery, and that not only the placenta ſeparates with more difficulty when the womb has not contracted itſelf, but alſo a greater hæmorrhage muſt happen, it will appear no wonder that weak women ſhould be ſo liable to faint at this time, eſpecially if they have been kept in an erect poſture, and the midwife is too anxious to bring away the placenta ſoon. Hence we ought to learn to deliver ſuch lying in a bed, or on a couch; and the uterus ought to be allowed ſome time to contract; and the mother ought to have time given her to recover the fatigue of her throws, before the after-burden is brought away. Hence alſo we may be convinced, how neceſſary ſoft compreſſion by bandage is on the belly after delivery.

XII. When the quantity of the mother's blood is ſmall, or when the contraction of the uterus is very quick, or when an obſtruction happens in the arteries of the ſinuſes, the cleanſings will be in very ſmall quantity. The conſtitution of the patient, and the ſtate of the pulſe, readily diſcover what the want or too ſmall quantity of the lochia depend on; and, in the firſt ſuppoſition, there is no harm from this ſtoppage, but we do miſchief if we attempt to force them; but, in the other caſes, we ought to encourage this evacuation by ſoft relaxing internal medicines, and by injections, fotuſes, &c. applied to the womb, or near it, while other evacuations are promoted or made, if the ſymptoms become urgent

XIII. The liquor of the ſtomach being ſo thick (§ 30.) while all the digeſtive powers of a child are very weak at birth, we may eaſily underſtand what bad conſequences, ſuch as its ſticking to the guts, obſtructing the orifices of the lacteals, &c. may be produced by this mucus remaining there; and therefore ought to admire the wiſdom of our Creator, who has provided ſuch a thin diluent purgative milk at this time, for preventing theſe diſorders, and may hence learn how neceſſary it is to cleanſe the *primæ viæ* of new-born children by proper medicines, eſpecially when they are not ſuckled by their mothers, and have not a nurſe whoſe child is as young as themſelves.

XIV. The want of reſpiration to ſqueeze forward the bile, and the reſiſtance made to its entry into the guts of foetuſes, by the tough ſlime which lines the inteſtinal tube, make the effuſion of their bile very ſlow; and therefore their gall-bladder is generally full of a green ſharp bile. Hence at birth, or ſoon after it, children are often obſerved to have the jaundice, the thick ſlime producing the ſame effects in them, as is diſputed for from Stones in Art. XXXIII. of your firſt volume. This jaundice generally yields to any gentle purgative, and very often is carried away by any medicine that increaſes the contraction of the guts; which is no more than might be expected from underſtanding the cauſe of the diſeaſe. It is alſo from this collection of bile during geſtation, that children are ſo frequently ſubject to gripes and green purging ſoon after birth, which cleanſes their guts of the unneceſſary ſlime and meconium, and diſcharges that ſharp bile, which might bring on diſorders of worſe conſequence, if it continued to lodge there: So that, however troubleſome it may be to the innocent babes, they are generally the better for it afterwards.

XV. From the care bountiful Providence is at, not only to ſupply a ſufficient quantity of nouriſhing juices to the foetuſes of animals and plants, but alſo to furniſh ſubſtances prepared by the mother's organs, for ſerving them after they are ſeparated from her, viz. milk in the viviparous, the yolk in the oviparous animals, and the farinaceous ſubſtance of the ſeeds in plants: And from what we obſerve of brutes, who follow the dictates of nature more cloſely than man does, how they only gradually come to uſe the common food of their parents, we may be convinced that the food provided by nature, milk, is the moſt proper for infants; that a ſudden change of food is dangerous to ſuch tender creatures, and that therefore the food given children when they are to be weaned from the breaſt ſhould be ſuch as is neareſt to milk, and the breaſt ought to be taken only by degrees from them. By which method I have often prevented all the troubleſome diſorders which generally attend weaning.

XVI. From what was remarked above (§ IV.) of the diſorders women are frequently ſubject to when their menſtrua are about to flow, we may rationally conclude that a nurſe, who has ſuch a redundancy of ſuperfluous liquors, will have her milk changed to the worſe. And, from what all practiſers in phyſic have obſerved of the effects of deriving a more than ordinary quantity of our juices to one part, in order to make a revulſion from another, we have reaſon to think that a nurſe, whoſe menſes are brought on by any other cauſe than a ſuperfluity of liquors, will come not only to have leſs, but alſo worſe milk after ſuch an evacuation; and therefore a nurſe who menſtruates ought not to be choſen. But, if particular circumſtances oblige us to continue a child with ſuch a nurſe, we ought to conſider the cauſes that occaſion her menſes to flow, and according to theſe we are to order the child to be kept up from the breaſt, either before the avacuation in the firſt ſuppoſition, or for ſome time after it, when it has been brought on by any other cauſe.

XII. *The* Brain *forced by coughing through the Cicatrice of a Wound of the Head, where a conſiderable Piece of the* Cranium *had been taken out; by Mr* JAMES JAMIESON, *Surgeon in* Kelſo.

SOME ſlates falling from the roof of a houſe four ſtoreys high, upon the head of a girl about thirteen years of age, broke and ſhattered her cranium at the place where the ſagittal and coronal ſutures meet, making a depreſſion of the bone of about four inches diameter. The ſymptoms attending this accident were common, viz. an univerſal ſtupor, bleeding at the noſe, difficulty of breathing, with a full irregular pulſe. I immediately took twelve ounces of blood from her arm, and ſent for all the phyſicians and ſurgeons of this place, who agreed to trepan her ſpeedily, which I performed. When I endeavoured to raiſe the depreſſed pieces of bone, they were all found ſeparated from the neighbouring ſound bone, and therefore were all brought away, and ſo left a terrible chaſm in the cranium. The dura mater was covered with a ſyndon dipped in *mel. roſar.* with a little tincture of myrrh, pledgets wet in the tincture were applied to the cranium, and the other common dreſſings were put on. Being laid in bed, an emollient clyſter was injected, and procured two plentiful ſtools; and before night ſhe re brutes, who follow the dictates of nature more cloſely than man does, how they only gradually come to uſe the common food of their parents, we may be convinced that the food provided by nature, milk, is the moſt proper for infants; that a ſudden change of food is dangerous to ſuch tender creatures, and that therefore the food given children when they are to be weaned from the breaſt ſhould be ſuch as is neareſt to milk, and the breaſt ought to be taken only by degrees from them. By which method I have often prevented all the troubleſome diſorders which generally attend weaning.

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She was kept at a low diet; and the cure went very ſucceſsfully on, and was completed ſo far in three months, that the teguments were cicatrized.

On the fifth day after her wound, I had cauſed a plate of lead to be made for covering all the dreſſing, and kept it on all the time ſhe was under my care, with two pieces of broad tape put through four holes, one on each ſide of the plate before, and the other two behind, tying the ends under the lower jaw, and behind the occiput.

Notwithſtanding the wound being ſkinned over, I recommended the conſtant uſe of the plate of lead laid over a compreſs upon the cicatrice, to ſupply the want of bone; and ſhe kept it on two months after I left off ſeeing her: But then, thinking herſelf ſecure, ſhe laid it aſide, and continued well ſeven months more, when the kink-cough, (*tuſſis convulſiva*), then epidemic in this place, ſiezed her; and was ſo violent one night when ſhe was in bed, that the cicatrice in her head was lacerated, and the brain was puſhed out at the teguments. Being inſtantly called for, I found above two ounces of the brain lying on the ſcalp: After cleanſing this away, I applied dreſſings with the plate of lead over them, thereby preventing a greater diſcharge.

The ſymptoms that followed this direful accident were an entire paralyſis of the limbs, ſhe retaining ſtill the uſe of her reaſon and tongue, but much inclined to ſleep, with a low depreſſed pulſe and *anxietas cordis*, and her urine was diſcharged involuntarily. In this condition ſhe continued five days and then died. Her friends did not allow any inſpection into the ſtate of her brain after death.

This girl's caſe will teach us how little we need be ſurpriſed at tormenting head-achs being brought on by frequent violent coughing, when the brain muſt be ſo ſtrongly preſſed on the cranium.

We may likewiſe learn, from the unhappy accident that occaſioned this girl's death, to be very careful to ſupply any part of the cranium that is wanting, eſpecially after the bones of it are ſo firmly joined as to prevent their yielding, and thereby enlarging the cavity within them.

Since I did not open the body, I can pretend to aſſign no cauſe, why the parts furniſhed with nerves from the *medulla ſpinalis* ſhould have been ſo much affected with palſy in the five laſt days ſhe lived, while ſhe retained her ſpeech and ſenſes, contrary to what might have been expected.

XIII. *The Cure of an Ulcer in the Cheek, with the ſuperior ſalivary Duct opened; by* ALEX. MONRO, *Profeſſor of Anatomy in the Univerſity of* Edinburgh.

MR KER of Frogton, a young gentleman of a delicate conſtitution, and threatened with a conſumption from an ulcer in his

lungs,

lungs, was ſeized, after riding in a cold night, with a very hard tumor about the middle of his left cheek; which the gentlemen who attended him endeavoured at firſt to reſolve; but, obſerving a ſuppuration to come on, it was opened with a lancet on the inſide; and afterwards an external orifice was alſo made, and eſcharotics were applied to waſte down the hard ſtool of the tumor that ſtill remained. When no more hardneſs was felt, his ſurgeon endeavoured to incarn and cicatrize, but was diſappointed by a conſtant plentiful diſcharge of a thin clear lymph. The orifice was again enlarged, and it was dreſſed a conſiderable time with adſtringents and driers in different forms, but without any ſucceſs.

In September 1727, being accidently in the neighbourhood of Kelſo, where Mr Ker lived, I was ſent for thither, to adviſe with Drs Abernethy and Scott, phyſicians there, and with Mr Jamieſon ſurgeon, concerning his cure. The external orifice in his cheek was as large as would have received the point of my thumb; and, at the bottom of it, we could diſtinctly ſee ſome part of the ſuperior ſalivary duct laid bare, with a hole in the outer-ſide of it, large enough to allow the button of a middle-ſized probe to enter it; and, when he moved his lower jaw at our deſire, the ſaliva ran out plentifully at that orifice. When the jaw was not moved, a very ſmall quantity of the ſpittle ouzed out; but, in time of dinner, it made a napkin, laid eightfold over the plaiſter that covered the ulcer, wet all through.

We agreed to make an artificial opening for the ſaliva into his mouth, which I did in the following manner: Having with two fingers of one hand ſtretched his cheek outwards, I directed the point of a large ſhoemaker's awl, which I held in the other hand, into the open breach of the duct, and thruſt the awl obliquely forwards through the cheek into the mouth, betwixt my two fingers; then drawing back the awl, I paſſed an eyed flexible probe, mounted with a ſmall cord of ſilk, through the paſſage made by the awl, and brought it out between his lips with my fingers, leaving one half of the cord hanging from the external ulcer; then the ends of the ſeton, being diſengaged from the probe, were tied looſely near the angle of the mouth; and his external ulcer was dreſſed up with dry lint kept on with a plaiſter. He was deſired to rinſe that ſide of his mouth frequently with brandy; and the ſides of the external ulcer were kept from growing out too faſt or turning callous, with the lunar cauſtic. In leſs than three weeks, this management had the deſired effect of rendering the paſſage, in which the cord was engaged, callous, (which the looſeneſs of the cord, and the want of pain when it was drawn, plainly ſhewed); when Mr Jamieſon took out the cord, and cured up the external ulcer very ſoon. In a little time after, I ſaw our patient here in Edinburgh, with a firm cicatrice on the part where the ſore had been.

This operation is plainly directed by my friend Mr Cheſelden in theſe words[*]: "When

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[*] Anatom. Book iii, chap. 3.

" this duct is divided by an external wound, " the ſaliva will flow out on the cheek, unleſs " a convenient perforation be made into the " mouth, and then the external wound may be " healed." See Vol. III. Art. 13.

My ſucceſs in this caſe has encouraged me to attempt ſome improvements in analogous operations, which I ſhall probably communicate to you hereafter. When I ſent this paper to you in 1732, I believed it to be the only inſtance of a cure of the opened ſalivary duct by an artificial opening into the mouth; but have ſince read Saviard's book of chirurgical obſervations, in obſ. 121. of which Mr. de Roy communicates the hiſtory of ſuch a cure performed by perforating the cheek with an actual cautery.

XIV. *A remarkable Extravaſation of Blood after the Operation for the* Hydrocele; *by Mr* JAMES JAMIESON, *Surgeon in* Kelſo.

A Gentleman about ſixty years old was afflicted with a hydrocele in the left teſticle, which obliged him to have the operation performed annually for four ſucceſſive years. I made the perforation with a ſmall diſſecting ſcalpel, and evacuated twenty three ounces of water each time, applying aromatic and aſtringent medicines to the ſcrotum, with a proper ſuſpenſory bandage, and recommending ſtrengthening diet and internal medicines after ſome doſes of purgatives. But he commonly neglected all the preſcriptions in a few days after the operation, and lived in an irregular enough way.

In two or three minutes after the water was evacuated, when I performed the operation the fourth time, about twelve ounces of pure liquid blood ran out at the orifice in a full equal ſtream, as from a large vein, without the ſmalleſt complaint of pain or other uneaſineſs; and then the hæmorrhage ceaſed of itſelf, with no other aſſiſtance than blooding him plentifully at the arm, and the dreſſings applied in the former operations.

He informed me next morning, that he felt a great weight and fulneſs in that teſticle, and all the way from it up to his groin; and, upon taking off his dreſſings, the ſcrotum appeared bigger than at any time of the hydrocele. In a conſultation with two phyſicians, Drs Cranſton and Scot, it was agreed that I ſhould make a large inciſion in the ſcrotum upwards from that made for the hydrocele, to diſcover the ſtate of the *tunica vaginalis* and teſticle. When I had made a wound about two inches long, we diſcovered the *tunica vaginalis* of a natural colour and texture, but very greatly diſtended; and therefore determined to make our inciſion through it alſo, having previouſly prepared all the dreſſings for caſtration, leſt we ſhould be obliged to perform that operation. As ſoon as the *tunica vaginalis* was cut, a great quantity of thick coagulated blood fell out; and by putting my finger all round the *tunica albuginea*, and upwards towards the rings of the abdominal muſcles, I brought out a good deal more. Having then cleaned the parts with an armed probe dipped in warm claret, we ſaw the teſticle, its veſſels and proper coats, in a ſound condition, which, with the want of any hæmorrhage, and the *tunica vaginalis*

nalis contracting itſelf quickly, gave us hopes of making a cure without any further operation. I applied pledgets dipped in claret wine mixed with *mel. roſ.* to the teſticle, and covered the reſt of the wound with pledgets, on which common digeſtive, with a ſmall proportion of *balſ. peruvian.* were ſpread. Over which I put the dreſſings formerly uſed in the hydrocele. His phyſicians confined him to a ſtrict cool regimen, and gave directions for evacuations by blooding, clyſters, or for cordial juleps, &c. as his circumſtances might require.

His cure went on in the ordinary way, without any troubleſome accident, and was completed in three weeks; the *tunica vaginalis* growing every where ſo firmly to the albuginea or proper coat of the teſticle, that he had not the leaſt appearance of the hydrocele during the three years he lived after his cure. The cauſe of his death was a fever attended with an aſthma.

Quær. How or from whence this great quantity of blood had been extravaſated?

XV. *An Hiſtory of the Operation for an* Aneuriſm *of the Arm, ſucceſsfully performed by Mr* JOHN MACGILL, *Surgeon in* Edinburgh.

THE Aneuriſm is a diſeaſe which chirurgical writers pretend to deſcribe with great exactneſs, and to relate the ſeveral ſymptoms by which the different ſpecies of it are diſtinguiſhed; while the particular hiſtories of this malady, handed down by obſervators, are ſo few and inaccurate, that of late the nature, ſeat, and ſymptoms of at leaſt the true kind, have afforded matter of diſpute, which can only be determined by a number of obſervations. In the following caſe, I had a good opportunity to remark exactly the progreſs, phænomena, and ſtructure of what was judged by all the phyſicians and ſurgeons who ſaw it to be a true aneuriſm; and therefore believe an account of it will neither be unacceptable to you, nor improper to be inſerted among the other papers of your collection.

James Forreſt a coachman, forty years of age, a heal ſtrong man, being thrown from the coach-box, broke the bones of his right leg into a great many ſmall pieces; and, a gangrene coming ſoon on, there was a neceſſity to perform the amputation in the country-place where he then was. The third day after this operation, he was let blood of by a young ſurgeon there, who opened the baſilic vein of the right arm. The patient felt a very ſharp pricking pain, while the ſmall inciſion was made with the lancet; and four days after, he obſerved a tumor about the bigneſs of a ſmall cherry at the wound, which he believed to be the common one of coagulated blood, called by ſurgeons thrombus; and therefore did not mention it to the gentlemen who performed the amputation.

On the twelfth day after his unfortunate fall, he was carried to town, and received into the infirmary, where the cure of his ſtump went on as well as could be wiſhed, without any accident or ſymptom to retard the cure.— After he had been eight days in the hoſpital, he told the phyſician and ſurgeon then attending, that he had ſome uneaſineſs from a ſwelling at the bending of his elbow. When it was examined, a tumor appeared of an oval form, as big as a ſmall hen-egg, ſituated behind the baſilic vein. The ſkin over this tumor was of a natural colour; no pulſation could be felt; and it adhered as firmly to the tendon of the biceps muſcle, as ganglions commonly do to tendons. Two days after, a pulſation, exactly ſynchronous to that of the arteries, was diſtinctly ſeen and felt. When the tumour was ſtrongly preſſed, it ſeemed to be leſs, but could never be made to diſappear. There was ſcarce any pain at this part, either in moving his fore-arm, or when the tumor was handled.

A conſultation of ſeveral phyſicians and of all the ſurgeons who attend the infirmary being called, the diſeaſe was unanimouſly determined to be a true aneuriſm; but the patient being ſtill weak, it was reſolved to try the effects of artful compreſſion, and to delay the operation till the patient had ſtrength enough to undergo it, unleſs the tumor ſeemed before that to be in hazard of burſting. Graduate compreſſes, wet in oxycrate, were therefore applied, with the proper bandage, which at firſt had an exceeding good effect in diminiſhing the tumor; but it ſoon after began again to increaſe: And then ſeveral machines, ſuch as that with a ſcrew for the *fiſtula lacrymalis*, Mr Petit's tourniquet, &c. were uſed, but without any ſucceſs; on the contrary, the tumor ſtill increaſed, and the ſkin began to inflame; and a ſmall ſuppuration was brought on the moſt prominent part of it. By laying aſide theſe more forcible machines, and returning to the uſe of the former compreſſes and bandage, after covering the ſmall ſuperficial ulcer with white ointment, the inflammation went off, and the ulcer cured. The tumor was now all firm and hard, ſcarce yielding at all to preſſure, except at that prominent point where it was ſoft, and where only the pulſation could be felt, when the fore-arm was bended: When the member was extended, no pulſation could be obſerved any where in the tumor.

The patient was not yet ſufficiently recruited, and therefore the operation of the aneuriſm was ſtill delayed: But, to prevent any danger from the ſudden burſting of the aneuriſm, the tourniquet was kept conſtantly applied to the patient's arm.

In the beginning of January 1733, the patient was judged to be ſtrong enough to ſuffer the operation, and the tumor increaſed ſo faſt, that there was great danger of the teguments yielding ſuddenly; and therefore the operation was not to be delayed any longer.—This happening to be the month of my attendance, I was of courſe to perform; but previouſly brought all the ſurgeons of the hoſpital together, to examine the ſtate of the tumor, and to determine the method to be followed in operating.

The tumor was of a very great bulk and height, its baſe extending internally as far as the internal condyle of the humeral-bone; and externally it had puſhed the tendon of the *biceps flexor cubiti* as far as the cephalic vein: It aſcended about three inches along the internal ſide of the biceps, and deſcended as far below the joint of the elbow, being alſo conſiderably prominent forward.

Being uncertain, whether this tumor was formed without the artery, or if it was the body of the artery dilated, we determined to do the operation in the moſt cautious, though more tedious way, viz. by diſſection; having alſo all the inſtruments and dreſſings for an amputation ready, in caſe there was no hope of ſucceſs from the operation of the aneuriſm.

Having applied the tourniquet in the common way to prevent any hæmorrhage, the ſkin was pinched up about the middle of the tumor, and cut with a biſtory; then a ſmall directory being puſhed into the fatty cellular membrane, firſt upwards, then downwards, and to each ſide, I cut upon it with a biſtory, and thus made a crucial inciſion on the whole extent of the tumor. After which I diſſected the four angles of the teguments from the tumor with a convex-edged ſcalpel, ſtitching a cutaneous artery that would otherwiſe have been uneaſy to me. The tumor, thus laid bare, appeared covered at its upper part with a thin cellular membrane; but below, it ſeemed to have a very ſtrong tendinous-like coat, which we ſoon diſcovered to be no other than the aponeurosis of the biceps muſcle; after ſeparating with my fingers the adheſion this had to the tumor below it, I cut it through to the loweſt part of the aneuriſm, which now was all bare and full in view. The coat of it was only a very thin tender membrane, which appeared eroded, as well as the firm ſubſtance it contained, at that prominent ſoft part, where, as I mentioned before, the pulſation was only to be felt. In endeavouring to ſeparate the tumor from the adjacent parts with my fingers, its tender membrane was eaſily torn in ſeveral places; and therefore, without inſiſting on ſuch a ſeparation, I opened the membrane from one end to the other, when ſeveral ounces of a blackiſh grey coloured liquor, like to coffee made of half-burnt beans, ran out, and ſeveral pieces of coagulated grumous blood, and of polypous concretions, fell down to the floor. What remained was one large polypous-like ſubſtance that weighed ſix ounces, below which ſome ſpoonfuls of that blackiſh liquor, mixed with pretty pure blood, were taken out with a ſpunge. There were no bridles or fleſhy beams ſtretched tranſverſely from one ſide of the cavity to the other; but the humeral artery, involved in all its coats, came fully in view. About the middle of the bare part of the artery we ſaw a hole, large enough to receive the largeſt ſurgeon's probe, without any retorted lips, or other ſign of the interior membranes having been extended through the exterior, but exactly of the ſame appearance as if it had been made by an oval ſharp-pointed inſtrument. After, by unlooſing the turniquet a little, we had made ſure of what we ſaw, being the wounded artery, one of the gentlemen, who aſſiſted me, put in a ſtrong probe by the orifice, and, with it, raiſed the artery, ſo that I eaſily paſſed the aneuriſm-needle, with proper thread, behind the artery both above and below the orifice, without engaging the nerve or vein within the thread. I made the two ligatures in the common way, the patient complaining much of pain while I tied the ſuperior threads, and then untwiſting the tourniquet, only ſome few drops of blood oozed out at the aperture in the artery; and the other common dreſſings and bandages were applied.

The polypous lump we took out was very hard and firm on the ſide next to the ſkin, except where, I ſaid already, it was eroded in the middle; but turned ſofter in a lamellated way as it approached the artery, till it degenerated gradually into mere coagulated blood.

During half an hour after the dreſſings were applied, the right hand remained cold and ſcarce ſenſible, but gradually then recovered ſenſe and heat. Next day, that hand was a little ſwelled, and, on the ſecond day, became ſo big, as to oblige me to take off the thick compreſs that was preſſed on the humeral veſſels by the exterior bandage; after which, and fomenting the hand with warm water and brandy, the ſwelling decreaſed.

On the fifth day after the operation, the dreſſings were removed; and the wound began to ſuppurate in a very right way, and was cured entirely before the end of March, without any accident; unleſs that, on the 22d of January, blood made its way through all the dreſſings: It had come out from the hole of the artery, but ſtopped as ſoon as the dreſſings were removed; and no hæmorrhage ever happened afterwards. In the time of the cure, the hand often became oedematous, and ſometimes a gentle eryſipelas attacked the ſkin of it, but ſoon yielded to an embrocation with the *aq. mindereri*, or to *aq. calcis*, with ſome brandy. The threads, with which the artery had been tied, did not come out till the middle of March.

We never could feel any pulſe below the elbow, ſince the operation. The member is weak; but he can perform the motions of the fore-arm, hand, and fingers. He ſtill complains of a numbneſs and difficulty of motion in the thumb and fore-finger more than in any of the reſt, though it is now two months ſince the wound was ſkinned over.

N. *The pulſe, after ſome months more, returned to the wriſt; but the numbneſs and feebleneſs of the thumb and fore-finger remained.*

XVI. *REMARKS on the Coats of Arteries, their Diſeaſes, and particularly on the Formation of an* Aneuriſm; *by* ALEX. MONRO, *Profeſſor of Anatomy in the Univerſity of* Edinburgh.

THE curious and accurate account of the aneuriſm, which was ſhewn to me before it was ſent you by a gentleman, to whom I ſtand indebted for many obliging acts of friendſhip, and Mr Macgill's deſire that I would endeavour to explain the nature of this diſeaſe, which appears neither to have been exactly examined, nor rightly underſtood by chirurgical writers, have given riſe to the following remarks on the coats of arteries, their diſeaſes, and particularly on the formation of the aneuriſm; and, as a ſequel to this, I ſhall ſoon lay before you ſome figures of the arteries of the arm, accompanied with a few reflexions on the aneuriſm occaſioned by venæſection, which is by much the moſt frequent that admits of any cure.

In ſeveral parts of the body, arteries receive a ſtrong firm covering from the contiguous parts, which has been deſcribed as their exterior coat; ſuch as, the membrane that ſurrounds the aorta, while it is within the pericardium; the pleura and peritonæum ſpread over the deſcending aorta in the thorax and abdomen, &c. But, ſeeing this coat is only to be obſerved in ſome parts, where particular purpoſes are to be ſerved, ſuch as ſtrengthening an artery, where it is more than ordinary expoſed to the ſtretching force of the circulating fluids, counteracting the reſiſtance made by ſome ſolid body on its oppoſite ſide, ſaving it from compreſſion, &c. I think it ought not to be conſidered, when we ſpeak of the coats of arteries in general.

All arteries are covered externally with a cellular ſubſtance, compoſed of very fine pellucid membranes, which are capable of being ſtretched, even ſuddenly, to a great extent without breaking; and they collapſe as quickly when the ſtretching force is removed. There is always more or leſs of an oily liquor contained in the communicating cells of this ſubſtance; and the proper veſſels of the arteries run in it, ſpreading branches every where on the cells for the ſecretion of that oil. When either the membranes are diſtended by a liquor thin enough to enter the cells, or when the exterior part of the membrane is gently drawn, the cellular texture is very evident; but, when a groſs ſubſtance is forced into the more internal part of this cellular membrane, it conceals the fine threads of the membranes mixed with it; and, whenever the cells are empty, they collapſe ſo cloſe together, that the whole appears to be one membranous coat, conſiſting of ſeveral layers.

All arteries are ſurrounded with ſuch a ſubſtance as I have juſt now deſcribed; and therefore it may be reckoned one of their coats: Though I muſt obſerve, that the ſame kind of cellular ſubſtance is common to, at leaſt, all the flexible parts of the body, where every little fibre is connected to another by the ſame contrivance. See Boerhaave's preface to his edition of the *Autores varii de morbo Gallico.*

This cellular ſubſtance of the arteries ſerves to connect them to the ſorrounding parts, without hindering or diſturbing their actions or motions; it prevents their being ſo readily compreſſed; it gives a ſafe paſſage to the veſſels of their other coats; it contains oil for lubricating and keeping the interior coats flexible.

What really deſerves to be called the firſt proper coat of the arteries, is the muſcular or tendinous, which, in the human body, at leaſt, conſiſts of annular fibres connected ſtrongly together. It is to theſe principally that the recoiling of an artery is owing, after it has been diſtended by the ſuperior force of the ſyſtole of the heart; and the elaſticity of the ſubſtance connecting the annular fibres, which is of the cellular kind, is very remarkable in the quick contraction of an artery, after it has been ſtretched longitudinally.

The moſt internal coat of arteries cannot be rightly obſerved while they are ſound and recent; becauſe it is ſo thin, and adheres ſo firmly to the muſcular coat, that it appears in form of a very thin layer of longitudinal fibres: But, after the arteries are kept ſome time, and their texture becomes more eaſily unravelled by the beginning putrefaction, it ſeparates very eaſily, and ſhows numerous inequalities on its interior ſurface, with veſſels diſperſed on it, and a cellular ſubſtance is ſeen connecting it to the muſcular coat. But there is no appearance of any muſcular ſtructure in it, and it tears very ſoon upon attempting to diſtract or ſtretch its fibres; ſo that it would ſeem to bear a very ſtrong reſemblance and analogy to the villous coat of the inteſtines, whoſe proportional greater diſtenſions and contractions above what arteries ever ſuffer, and thicker *tunica cellularis interna*, will account for the papillæ and rugæ, ſo much more obſervable in the guts than the arteries. I ſuſpect it muſt be this coat which Mr Winſlow * calls the *duvet*, which he affirms he ſaw filling up the cavity of the ſmall ſecerning arteries of the glands, and on which he builds his account of ſecretion. I imagine it a membrane analogous to this, which, diveſted much of its cellular ſubſtance, forms the valves in the veins.

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* Mem. de l'Acad. des ſciences, 1711.

This interior coat will prevent any particles of our fluids from inſinuating themſelves into the cellular ſubſtance of the other coats; it renders the ſurface of the arteries more ſmooth and poliſhed than otherwiſe it would be; and we may conclude, from the analogy of other parts, that its veſſels ſeparate a liquor to protect and lubricate its own interior ſurface.

From the texture of the external cellular coat of arteries, as above explained, it is evident, that obſtructions are very apt to be formed here, which, according to the different ſeries of veſſels in which the obſtruction is, and the different natures of the obſtructed liquors, will produce various diſeaſes, as well as in the *tunica cellularis* elſewhere in the body, which is the ſeat of numerous diſeaſes that are ſaid by authors to affect other parts. To take but one example of the many which Boerhaave * names; here it is that inflammations are placed; this it is that melts down into pus in all ſuppurations. Let ſurgeons reflect whether ever they ſaw the proper muſcular fibres diſſolved into pus; or if firm membranes, ligaments, the ſkin, &c. do not caſt off in ſloughs, when they are eroded. Let thoſe who examine the bodies of people dead of pleuriſies, inflamed guts, &c. remark, whether the membranes ſaid to be affect-

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* Præfat. in Autores de morbo Gallico.

ed are not entire, and the pus is not collected in the cellular ſubſtance under the membrane. But, to return to the preſent ſubject, the diſeaſes of the external cellular coat of arteries may ſerve to diminiſh the diameter of the artery, if they compreſs it. If the oil in the cells becomes too thin, or only lymph is contained in them, the muſcular coat may be too much relaxed. If there is too ſmall a quantity of the moiſtening liquors, the artery loſes that flexibility that is neceſſary for it; and if the morbid matter becomes acrid, it may erode or deſtroy the muſcular coat, though this will be done with difficulty, becauſe of its firm texture. Hence we daily ſee large arteries long ſoaked in the pus of abſceſſes without any hæmorrhage.

The muſcular coat will be ſubject, as well as other muſcles, to too great rigidity or laxity, to convulſive contractions, or paralytic affections, though theſe will not ſhew themſelves evidently, becauſe of the action of the heart upon the artery, and of the elaſticity which this coat has, independent of the circulation.

What was ſaid of the texture of the moſt internal coat, will naturally lead one to think that it muſt be ſubject to diſeaſes, and that theſe will be much a-kin to the maladies of the external cellular coat, allowance only being made for the violent compreſſion which the internal one muſt always ſuffer, from the impetuous ſtream of blood on one ſide, and the briſk reaction of the muſcular coat on the other; the effects of which may be readily enough underſtood from what I have had occaſion to ſay elſewhere † on ſuch compreſſion. It is only in the cellular membranes of this interior coat, that ever I ſaw any of the bony or calculous concretions of arteries. I have more than once obſerved the cavity of a large artery almoſt blocked up by a ſteatomatous thickening of this coat, and frequently I have obſerved purulent matter collected in it.

Notwithſtanding the morbid ſtate of this coat, and of its cellular membranes by which it is connected to the muſcular coat, offers itſelf ſo frequently to the view of thoſe who diſſect the human body, practical authors and obſervators have not been at pains to remark, how far the animal œconomy was thereby diſturbed, I offer the few following conjectural queries to their conſideration. May not diſeaſes here often occaſion great inequalities and irregularities of the pulſe? May not a *tabes purulenta* have its ſeat here, without any bowel being affected? Will not a ſmall eroſion of this coat, and a conſequent oozing of the blood through the cellular texture of the other coats, more naturally account for the ecchymoſes that happen ſo frequently in diſeaſes, where the blood is acrid, than breaking of the veſſels can do? Are not the ſmall veſſels, where the motion of the fluids is ſloweſt, more liable to ſuffer this eroſion than the larger ones are?

The preceeding account of the coats of arteries may let us ſee, that no aneuriſm can happen,

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† Accounting for oſſification in the anatomy of the human bones, Part 1.

pen, unleſs through ſome fault of the interior coats; therefore it will be neceſſary to take a view of the ſeveral ways theſe coats may be ſo vitiated, as to give any chance for the formation of an aneuriſm.

1. A large opening made into an artery, with a proportional aperture in the teguments, produces only an hæmorrhage; but, if the external orifice in the ſkin is ſo ſmall, as not to allow the blood to eſcape as faſt out at it, as it flows from the artery, the neighbouring cellular membranes will ſoon be filled with blood; the member becomes every where ſwelled and diſcoloured; and, in ſhort, what is generally called a baſtard aneuriſm is formed.

2. If the aperture into the artery is very ſmall, and the blood cannot eſcape through the teguments, it will coagulate before it can be puſhed to any conſiderable diſtance from the orifice by which it eſcaped, and thereby an obſtacle will be made to the ſucceeding blood's ſpreading in the *tunica cellularis*, which ſoon will be formed into a lamellated membrane, by the oil being ſqueezed out, while the extravaſated blood becomes firmer and harder, ſo as to appear of the polypous conſiſtence, by the preſſure it ſuffers. I had ſometimes occaſion to be much ſurpriſed at ſeeing how ſoon ſuch a change can be brought on the arterious blood; the inſtances I mean are, where, after a limb was amputated, the patient's faintneſs hindered the arteries to ſpring as uſual, by which one lay undiſcovered, and was not ſtitched, but in a few hours

after the dreſſings were put on, occaſioned an haemorrhage, notwithſtanding the bandages had been tightly applied, and a prentice preſſed ſtrongly with his hand on the end of the ſtump. When the wet dreſſings were removed, I ſaw the clotted blood on them become firm, of a pale colour, and having the appearance of a fibrous texture. Since then ſuch coagulated blood is contained in a membranous ſubſtance, the diſeaſe, in the caſe we have ſuppoſed, will have the appearance of a circumſcribed incyſted tumor, which the pulſation of the neighbouring artery and the jett made at its open orifice will communicate a pulſation to, till either the bulk of the ſwelling, the quantity of liquor below the coagulum, or the great reſiſtance of the parts ſtretched on the tumor, render the vibration imperceptible; and, till once the polypous concretion turns very large, the tumor will become much leſs on compreſſing it ſtrongly, by the fluid blood being forced back into the artery through the perforation in its coats; that is, a tumor, attended with all the ſymptoms of what is called a *true aneuriſm*, is formed, though the principal part of the ordinary definition, viz. the diſtenſion of the proper coats of the artery, is wanting.

3. If the muſcular coat only is perforated, the interior coat will be puſhed out at the interſtice of the divided fibres, and, not being capable of being ſtretched far without breaking, the caſe is ſoon reduced to one or other of the two former ſuppoſitions.

4. If part of the muſcular coat only has ſuf-

fered a ſolution of continuity, the remaining fibres are either able to reſiſt the force of the blood without being diſtracted beyond their natural tone, in which caſe, they will reunite, eſpecially if they have been divided by a ſharp inſtrument cutting tranſverſely; but, when there is loſs of ſubſtance, or a longitudinal inciſion, the breach can only be made up by ſyſſarcoſis; but in neither caſe will either ſort of aneuriſm happen, unleſs more fibres afterwards yield to bring it to be no longer able to reſiſt the impetuous blood, as I think would for moſt part follow, from what I have ſeen in trying ſome experiments for obſerving what happens in an artery taken out of the body, when it is filled with quick-ſilver and preſſed, after ſome of the muſcular fibres have been cut or broke. If either then the fibres continue to break gradually, or the diſtenſion of them is ſudden, when all are torn, the diſeaſe is reduced to the ſuppoſition made in § 1. and 2.

5. When part of the fibres are broke, cut, or eroded, (any of which ways you may conceive the ſolution of continuity to be made on all the ſuppoſitions yet mentioned), we can imagine ſuch a proportion to remain entire, as being very near, but not altogether, able to reſiſt the fluids, will yield very gradually, and form a true aneuriſm, in the ſenſe the common chirurgical books explain it: But, beſides the many chances againſt ſuch a preciſe approach to an equilibrium happening between a leſed artery and its contained liquor, I muſt obſerve, that, though membranes become ſtronger and thicker

as they are gradually ſtretched; yet muſcular fibres ſeparate more and more, leaving larger interſtices: And therefore, if the annular fibres of an artery were thus ſeparated, the interior coat would ſoon yield in their intervals, and the blood would burſt out to form one or other of the tumors deſcribed § 1. and 2. and when it is confined, as in § 2. the circular fibres would appear like ſo many columns or croſs bars in the tumor; which agrees very well with ſeveral deſcriptions of aneuriſms handed down to us.

6. If a ſmall part of the muſcular coat of an artery loſes its natural tone, or contracting force, by any paralytic diſorder, it will yield to the ſtretching force of the blood; and thus an aneuriſm may be formed, which will have all the characters of what is commonly named a *true aneuriſm*. You ſee, that a partial palſy, and that very gradually coming on, muſt be here ſuppoſed; otherwiſe the fibres being ſeparated, and the internal coat breaking, will reduce it ſoon to the ſtate mentioned in § 5. and indeed it would appear from what is there ſaid, that, before it becomes of any very conſiderable bulk, we have reaſon to judge the ſame would happen here. Beſides, ſuch a palſy as has been here ſuppoſed will very rarely be formed, becauſe of the great ſympathy and connexion which the whole arterious ſyſtem has, the pulmonary artery and aorta making each one hollow muſcle continued from the heart to their ſmall ramifications: And I believe a palſy is ſeldom or never obſerved to affect only one ex-

tremity,

tremity, or the middle of a muſcle, while the other parts of it continue to be vigorous and active.

7. The only ſuppoſition we need make concerning the interior coat of arteries alone being affected is a ſolution of its continuity, which will readily happen by all ſudden overſtretching of an artery, or it may be made by any eroding cauſes, ſuch as ſuppuration, &c. I cannot ſay poſitively, that the want of this coat is capable of producing an aneuriſm, but ſhall offer a conjecture, which may poſſibly be improved afterwards by obſervation; it is this, when this coat is removed, ſome particles of our liquids may inſinuate themſelves into the cellular membrane connecting the muſcular fibres, and gradually enlarging theſe paſſages, may at laſt penetrate through it, to be diffuſed in the external cellular coat: And thus at length this caſe is reduced to what is mentioned towards the cloſe of § 5. I was brought into this way of thinking, partly by obſerving how readily cellular membranes tranſmit liquors, and by ſeeing air eſcape through all the other coats of the guts when the villous one is removed.

From the whole we may ſee, that what authors call now-a-days a true aneuriſm will very ſeldom be formed; which may be ſtill further confirmed by mentioning the remoter cauſes which are agreed on by all to occaſion it for ordinary; theſe are, wounds, bruiſes, ſtraining, loud laughing, crying, &c. All ſuch you ſee make a ſudden violent effort on the arteries, and therefore do not rightly anſwer to any of the ſuppoſitions we made of the manner this diſeaſe could poſſibly be brought on. And, to eſtabliſh what you ſee I argue for, of the true aneuriſm being a very rare diſeaſe, I peruſed a conſiderable number of hiſtories of aneuriſms, beſides thoſe mentioned by Dr Freind †, and could not find above two or three that were diſſected, ſo much as alledged to have been true aneuriſms; and there was not one, where it is ſaid that the aneuriſmal ſac conſiſted of ſtrong annular muſcular fibres; which muſt however be the true criterion whereby the true aneuriſm can be known, ſeeing from what was ſaid in § 2. confirmed by ſeveral accurate hiſtories, blood, extravaſated in the *tunica cellularis*, will have all the other ſymptoms that are deſcribed as proper to the true aneuriſm.

XVII. *Reflexions on the* Aneuriſm *occaſioned by Blood-letting; by the ſame.*

THE figures herewith ſent will give a better idea of the ſituation and courſe of the arteries of the arm that are the ſubject of the following reflexions, than any words can; and therefore I ſhall not trouble you with any verbal deſcription, but ſhall proceed to the explication of Table II.

Fig. 1. Repreſents the moſt ordinary diſtribution of the humeral artery.

1. A part of the pectoral muſcle.

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† Hiſtory of Phyſic, Vol. I.

2. The *biceps flexor cubiti.*

3. The *coraco-brachialis* muſcle,

iv. The *brachiæus internus.*

4. The *brachiæus externus.*

5. The *brevis* and *longus extenſor.*

6. The *pronator radii teres.*

7. The *ſupinator radii longus*, and *extenſor carpi radialis* drawn outwards by a thread.

8. The *ſupinator radii brevis.*

9, The *flexor carpi radialis.*

10. The common origin of the *palmaris longus* and *flexor carpi ulnaris.*

A The trunk of the humeral artery giving off branches in its courſe to the neighbouring muſcles.

B The place below the joint of the elbow, where it is about to ſplit into its two large branches.

C The radial branch.

D The common trunk of the ulnar and median arteries.

E A branch going off from the humeral artery above the elbow toward the internal condyle, behind which it anaſtomoſes ſometimes by a large canal with a branch ſent up from the ulnar; oftner they communicate by a great many ſmall branches, and frequently I could not diſcover any conjunction of theſe two arteries.

F The part of the humeral artery, where it commonly begins to be covered by the aponeuroſis of the biceps muſcle.

G A branch ſent up from the radial artery behind the external condyle of the *os humeri*, to anaſtomoſe with ſuch a branch of the humeral artery as E is.

The ſame parts are pointed out in the three following figures, by the letters and cyphers employed in the firſt figure, which makes a repetition of their explication needleſs.

Fig. 2. Is borrowed from Mr Cowper's Scheme of Arteries †

α Is a branch ſent off from the humeral artery, to anaſtomoſe behind the internal condyle of the humerus, with the artery β, which comes from the trunk of the ulnar and median arteries.

H The ulnar artery.

I The median artery.

k Branches given to the muſcles of the hand from the humeral artery, juſt as it is about to ſplit into its branches.

Fig. 3. Shews the humeral artery dividing into two great branches as it is coming out from the arm-pit. Theſe branches are repreſented as if they lay at each others ſides, which the oblique view I gave of them to the painter obliged him to; but the one γ, which afterwards becomes the radial, is placed directly anterior to the other in the ſubject, the ulnar δ lying pretty cloſe to the bone.

Fig. 4. Repreſents the humeral artery ſplitting near the middle of the arm, ε being the larger

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† Appendix to the anatomy of human bodies, Tab. III.

anterior more ſuperficial branch, which goes on to divide as the humeral artery in fig. 1. does, while the leſſer branch ζ runs cloſe on the bone to open into the common trunk of the ulnar and median arteries.

H The ulnar artery.

I The median artery.

L The branch marked β in the ſecond figure.

Not. The muſcles 6, 9, 10, are here cut through, and hang over the cubit, while thoſe marked 7, are drawn outwards, that the arteries might be diſtinctly ſeen.

I ſtill preſerve the arms repreſented by fig. 1. 3. 4.

By the diſtribution of the humeral artery in fig. 1. it would appear, that the artery, which is in hazard of being hurt by the lancet in blood-letting of the arm, is for ordinary the trunk of the humeral artery, and that the lancet muſt pierce the tendinous aponeuroſis of the biceps muſcle before it touches the artery. To be ſtill more aſſured of this, I puſhed pins into the arms of ſeveral bodies at the ordinary place where the baſilic vein is opened, and where the cicatrices of former venæſections were ſeen; and, allowing the pins to remain there, I diſſected the parts till I ſaw what has been above aſſerted to be true.

Sometimes, when the median vein is opened lower than ordinary, the radial artery may be hurt; but then its wound muſt be ſo near its riſe from the trunk, that it is impoſſible to make any ligature on the radial artery above the aperture; and therefore, ſeeing the humeral artery muſt be tied, if the operation of the aneuriſm is performed, the conſequences will be the ſame as if the humeral artery had been wounded.

In all patients, then, whoſe veſſels are diſtributed in the common way, without any conſiderable anaſtomoſis between the humeral artery and its large branches in the fore-arm, it is in vain to expect that any pulſe ſhould be felt at the wriſt, immediately after the operation of the aneuriſm is performed; and, at the ſame time, the want of a pulſe there needs not make the ſurgeon go on precipitately to the amputation of the member, becauſe the numerous ſmall anaſtomoſes may be ſufficient to keep life in it, and may poſſibly be gradually enlarged ſo much, as to reſtore vigour and ſtrength to it, and even to make a perceptible pulſe at the wriſt.

When the operation of the aneuriſm is performed at the bending of the elbow to one who has the anaſtomoſis repreſented in Fig. 2. the humeral artery muſt be tied, but the pulſe at the interior ſide of the wriſt will continue, and probably that on the exterior ſide will ſoon be reſtored, becauſe the blood may have the ſhort retrograde motion from the inſertion of the anaſtomoſing tube into the ulnar artery, to the place where the radial artery begins, without any great diminution of its momentum.

Thoſe who happen to have ſuch a diviſion of the humeral artery as is repreſented in Fig. 3. can only have the radial artery hurt in venæſection, and, after the operation of the aneuriſm, will have a ſtronger pulſe than formerly in the interior ſide of the wriſt, but will probably want it in the exterior ſide.

If the veſſels anaſtomoſe as in Fig. 4. you'll readily ſee, that, the anterior branch only being hurt, the operation of the aneuriſm may be performed without interrupting entirely the courſe of the blood either in the radial or ulnar artery; and therefore the pulſe may ſtill be felt in the common place on both ſides of the wriſt.

I have very little to add, by way of remarks on the hiſtory related by Mr Macgill, having, in the account already given of the formation of aneuriſms, prevented any explication of the principal phænomena. I may, however, obſerve, that in that hiſtory we can trace the gradual formation of the polypus, and, from the mixture of the deeper-coloured parts of the blood then ſqueezed out, with ſome of the diſſolved cellular membrane, may underſtand how a liquor, like to coffee made of half-burnt beans, could be collected within this aneuriſm.

If the common notion of the true aneuriſm being a ſac formed by the dilated muſcular coat of arteries, has not had its riſe from theory only, I would ſuſpect that the firſt aſſertors of it, ſeeing the pleura covering an aneuriſm in the thorax, or the tendinous aponeuroſis of the biceps here in the arm adhering firmly to ſuch

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Fig. 1

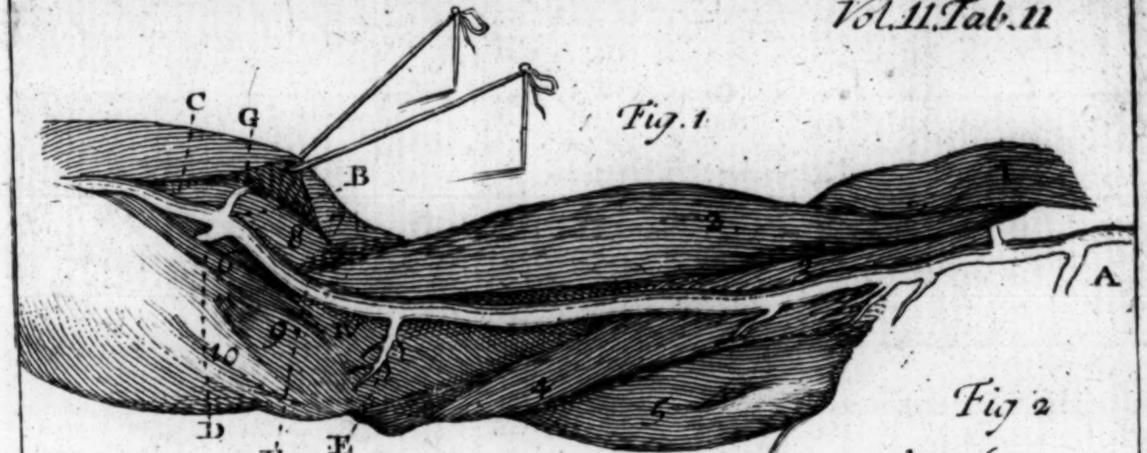


Fig 2

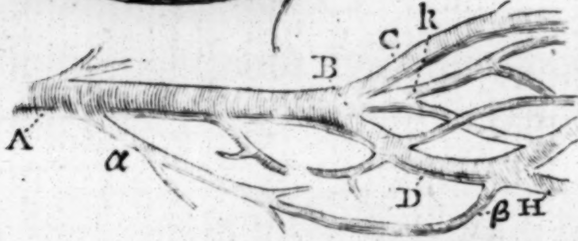


Fig 3

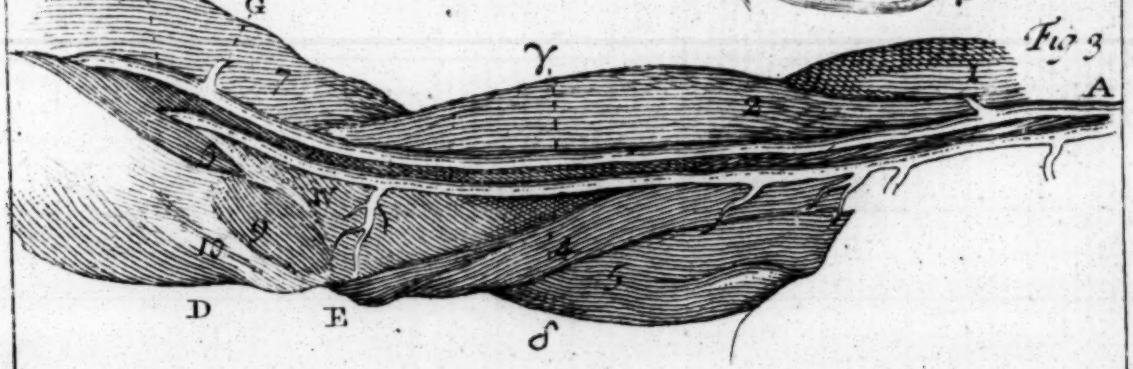
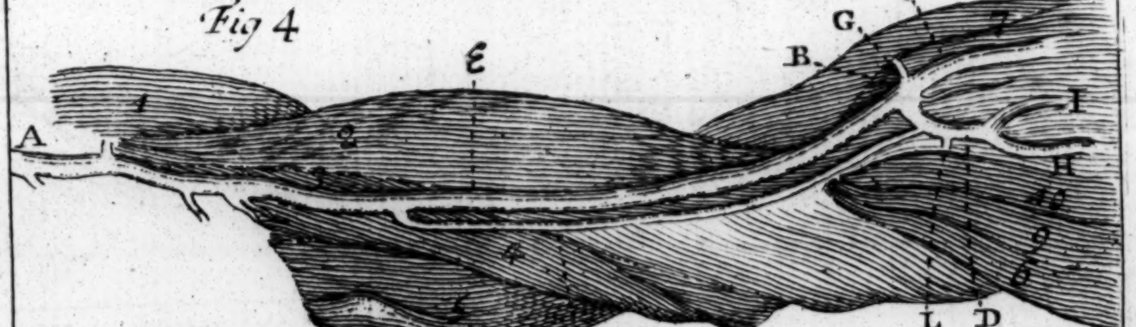


Fig 4



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a tumor, miſtook them for the muſcular coat of the artery. I have an argument for this ſuſpicion which ſeems very ſtrong to me, whatever it may do to others, who are leſs liable to miſtake one thing for another; it is this, That, notwithſtanding my theory and diſſections had brought me to think true aneuriſms to be at leaſt a very uncommon diſeaſe; yet, when I ſaw Mr Macgill lay the tendinous aponeuroſis bare, I was ready to have renounced my opinion, being perſuaded it was the muſcular coat of the artery, till he moſt dexterouſly proſecuted the aponeuroſis to its riſe from the biceps, and ſo fully convinced me of the miſtake, into which I ſhould moſt readily have been led without diſcovering it, if the operation had been performed in the more ſpeedy way of laying the whole tumor open by one inciſion.

XVIII. *Hiſtories of a Fever and of an Epilepſy; by* ANDREW ST. CLAIR, *M. D. and Profeſſor of Medicine in the Univerſity of* Edinburgh.

AMONG the various difficulties which attend the practice of phyſic, a conſiderable one ariſes from the reſemblance of ſymptoms in diſeaſes of a different nature. Hence it is that young practitioners are commonly at loſs what method of cure to follow, where the appearances don't fully diſcover the nature of the diſtemper: For, however carefully a young phyſician, during the courſe of his ſtudies, be warned not to expect that he ſhall find diſeaſes as diſtinct in fact, as the rules of teaching require them to be explained; yet it is very natural for him, at his firſt ſetting out in practice, to judge of the nature of the diſeaſe by its firſt appearances, and to ſettle the method of cure accordingly. It may, therefore, perhaps be of ſome uſe to ſuch, for whoſe benefit hiſtories of particular caſes are chiefly intended, to communicate, as occaſion offers, inſtances of ſuch caſes as in the iſſue were found to be different from what they appeared at firſt.

With this view I ſend you the two following accounts, one of a fever, the other of an epilepſy, not indeed remarkable for any thing new or wonderful, far leſs for the ſucceſs which attended them. As they both proved fatal, I need not tell you, that neither vanity nor intereſt are the motives which determined me to make them public; and I willingly leave it to proper judges to decide, whether any thing has been omitted or miſapplied in the cure of either. If they contribute in any meaſure to prevent too haſty a determination of the nature of diſeaſes, and to engage young practitioners to attend more to their ſymptoms than their name, in applying remedies, I ſhall have my wiſh.

A boy, ten years old, of a ſlender habit of body and delicate conſtitution, was ſeized, about ſeven years ago, with the ſmall-pox of the confluent kind, and reduced to the greateſt extremity. During his ſickneſs, he was under the care of a phyſician of this place, eminent for his extenſive and ſucceſsful practice;

and at length was reſtored to health again, tho' with the loſs of his left eye, and weakneſs of the right, which ever after was ſubject to inflammations from the ſmalleſt accidents. He was afterwards attacked ſometimes with a looſeneſs, attended with feveriſh fits and vomitings, which yielded to gentle vomits and purges of rhubarb. He had recovered the laſt of theſe about four days, when, on the 13th of October 1732, he was taken with wearineſs, coldneſs, and ſhiverings, which were ſoon ſucceeded with burning dry heat, and then with ſweating.

October 14. Next day he was free of all complaints, except unuſual wearineſs and want of appetite.

15. The day following, being called to him for the firſt time, I found him very feveriſh, and was told the cold fit had returned three hours ſooner than on the 13th; he was free of head ach and vomiting, his eye was ſlightly inflamed, his tongue whitiſh, his breathing ſomewhat oppreſſed with frequent ſighs, his ſtools of a natural conſiſtence, and his urine of a ſtraw-colour, with a white ſediment. In the evening, after bathing his legs, he had a ſweat, and a reſtleſs night; his urine then was thick, with a ſediment as before.

16. He got a vomit in the morning, of the infuſion of *ipecacuan. ſcrup.* ii. which operated only once, part having been loſt in preſſing him to drink it. Through the day, he made no water, was coſtive, drowſy, and inclined to rave, his pulſe ſoft, weak, and ſcarce frequent.

In the evening he got a turpentine clyſter, which procured him a plentiful ſtool, and a large diſcharge of urine, with a lateritious ſediment. He was reſtleſs till four next morning, then ſlept ſound.

17. He continued to ſleep all next day, almoſt without interuption till evening, had frequent grindings with his teeth, no cold fit, nor any thing like a new paroxyſm; his pulſe grew gradually more frequent through the day, but continued ſoft, full, and weak. His back was bliſtered in the evening, he drank emulſion, and had a reſtleſs night.

18. Next morning he was little ſenſible, but reſtleſs, his pulſe ſmall and frequent, his breathing free, his tongue dry, his urine thick, high-coloured, with a large brown ſediment. The *cataplaſmata craton.* were applied to his ſoles, and a ſpoonful of the *decoct. ſerpentar. comp.* was given every two hours. At noon the ſtupor was leſs, his pulſe ſometimes ſtronger, but variable; afterwards the reſtleſſneſs and ravings increaſed till ſix of the evening, when he fell into a ſound ſleep. He had paſſed no urine for eighteen hours, till now that he got a milk-clyſter, and urined plentifully, but had no ſtool.

19. He toſſed all night, had a great ſweat on his head, and frequently grinded his teeth. In the morning his pulſe was weak and quick, the ſtupor much increaſed, and his countenance ghaſtly; bliſters were immediately applied to his arms and ancles, emulſion was given for his ordinary drink, and a ſpoonful of the following mixture every two hours.

℞. *Decoct. ſerpentar. comp. ſine mecon. unc.* iv.
Sp. ſalin. aromat. ſcrup. ii. *M.*

Through the day his pulſe continued variable, ſometimes weaker, ſometimes ſtronger; the ſtupor commonly abated upon taking the mixture, but ſoon increaſed again; his head and palms only ſweated plentifully. In the evening he paſſed water inſenſibly, and could ſwallow nothing but liquids. The cataplaſms at his ſoles were renewed; he was more reſtleſs in the night than before, ſhrieked often, made water inſenſibly, and the ſweating of his head increaſed.

20. Towards morning he got ſome reſt, and then the ſtupor was much abated, his judgment leſs diſturbed, his tongue dry, of a deep red colour, but not furred, his pulſe ſomewhat ſtronger; a large diſcharge followed upon removing the bliſters, and the ſweating of his head was almoſt gone. Thus he continued till evening, that his pulſe grew quicker and weaker, his tongue moiſt; he became reſtleſs, paſſed water inſenſibly, raved, ſhrieked and toſſed till two in the morning, then grew calm: At night his head was ordered to be bliſtered, but he was not able to bear ſhaving it. The cataplaſms were renewed at his ſoles.

21. After a ſoft ſleep all the former ſymptoms returned with more violence, while his pulſe grew weaker; bliſters were applied in the morning to his thighs; the emulſion and *decoct. ſerpentar.* continued as before. No change happened through the day. In the evening he got a clyſter, which he could not retain, and late at night was almoſt choaked

with tough defluxion in his throat, which was brought up by the following mixture.

℞ *Gumm. ammon. drach. ſem. Solvatur in aq. ſtill. hyſſop. unc.* ii. *Acet. ſcillit. drach.* i. *M.*

Of this he took thrice at an hour's diſtance, till he got free of the defluxion.

22. Next morning his pulſe was weaker and more frequent, a great ſweat on his head and hands, with a gentle moiſture over his body, no defluxion in his throat; the reſt as yeſterday. He got the following powder in a ſpoonful of ſack-whey at noon, and had it repeated in the evening; the ſweat however on his body did not increaſe through the day, and ſtopped altogether at night.

℞ *Rad. ſerpentar. virg. gr.* vii. *Caſtor. Ruſſ. gr.* iii. *Camphor. pur. gr.* i. *M. f. pulvis pro doſe.*

As ſoon as the ſweat ſtopped, his pulſe became ſo weak and quick as ſcarce to be reckoned; he had frequent deep ſighs, though his breathing was otherways eaſy. About midnight the defluxion returned to his throat, and at three of the morning he died.

His food, while he could take any thing ſolid, was chiefly bread-berry, ſtoved barley, and bread ſoaked in tea, or weak ſack-whey. His drink (beſides emulſion) was barley-water, tea, and weak ſack-whey, by turns.

A child about four years old, well made, nimble, and of a beautiful florid complexion, towards the beginning of laſt winter, was taken with an obſtinate cough, night-ſweats, waſte of fleſh, and other bad ſymptoms, which threatned a decay; but, by due and timely uſe of gentle vomits, balſamics, aſſes milk, and country air, he ſeemed to recover perfect health, notwithſtanding an unfavourable ſeaſon: For his appetite became good, his digeſtion eaſy, no unnatural thirſt or heat, no cough, his breathing free, his ſleep ſound and calm, no night ſweats, nor was he ſoon fatigued at play, but grew ſtrong, and recruited fleſh daily, till he recovered his uſual habit of body.

On the 25th of January 1733, he complained of a pain at his ſtomach, and itching at his noſe; he was reſtleſs in the night, and his ſleep frequently interrupted by ſudden ſtartings. Mr Macgill, who had been ſo ſucceſsful in relieving his former complaints, gave him three grains of *mercur. dulc.* (the boy being ſhy to take unpleaſant medicines) which procured him a looſe ſtool or two, without any thing uncommon.

January 26. The ſymptoms continued the ſame, together with a diſpoſition to rave. He got a clyſter that day, which moved his belly once.

27. He was brought to town from the country in the neighbourhood. At three afternoon I was called to him, and found him raving without interruption, ſcratching his noſe, ſhrieking frequently; and was told, that, when he ſlept, he waked ſuddenly with ſtartings, and cried out as if frightened. His pulſe was full, ſtrong, and quite calm. He was immediately blooded at the arm, and afterwards got the

following powder, which was repeated at night, and early next morning.

℞ *Æthiop. miner. gr.* v. *Ent. vener. gr.* ii. *M. f. pulvis pro doſe. Fiant hujuſmodi doſes* iii.

In the evening he got a clyſter, and had one ſtool by it. He raved inceſſantly all night, except in the time of ſhort ſleeps, which were diſturbed as before with ſtartings and ſhrieks. He ſcratched his noſe almoſt without interruption, ſleeping and waking.

28. In the morning he knew no body, his pulſe was quite calm, ſoft, and ſufficiently ſtrong. The former doſe of *merc. dulc.* was repeated and half an ounce of tinct. of rhubarb, drunk above it. About noon he was ſeized with an epileptic fit, which laſted ten minutes, and was ſucceeded by a ſecond about an hour after. A bliſter was immediately applied betwixt his ſhoulders; he got emulſion to drink, and a ſpoonful of the following mixture at the approach of a fit, or when it went off.

℞ *Aq. ſtill. Flor. chamæm. unc.* ii. *Rut. unc.* i. *Tinctur. caſtor. drach. ſem. Sp. C. C. gutt.* xv. *Syrup. caryoph. unc.* i. *M.*

In the evening having had no ſtool all day, he got a purgative clyſter, which moved his belly once. He paſſed this night as the former.

29. About ſix in the morning, he had another fit, which laſted longer than either of the former. The other ſymptoms as yeſterday. The *mercur. dulc.* with tincture of rhubarb was repeated; but, no ſtool following, the purging clyſter was given about one afternoon, which was returned with very little mixture of fœces,

and immediately after, ſharp cataplaſms were applied to his ſoles. In the afternoon he became quite ſenſible, and continued ſo about two hours. Towards evening the ravings returned; his pulſe continued ſoft and calm; bliſters were applied to his ancles, and he got the following draught.

℞ *Tinct. rhei. ſimp. unc. ſem. Syrup. de rhamn. drach.* ii. *M.*

30. At four of the morning he had another fit ſtill more ſevere, then a looſe ſtool, and ſlept after. His pulſe at nine was full but languid and ſlower than that of a man in health. The laſt purgative was repeated without any effect. At noon he ſeemed to be dying, but towards the evening his pulſe and look grew better. A bliſter was ordered for his head, but not applied; the purgative was then renewed. In the night the fits returned, and continued with little intermiſſion. He had no ſtool.

31. Next morning the fits continued, he got the following mixture.

℞ *Syrup. de rhamn. cath. drach.* ii. *Tinct. jalapp. gutt.* xv. *M.*

This procured him a looſe ſtool after noon. In the evening the fits ſtill continuing, his neck and body were much diſtorted; he had no pulſe, and died next morning at ſeven.

During his ſickneſs he took ſometimes a little light ſpoon-meat, and drank emulſion, tea, and barley-water.

Upon opening the body next day, we found the bowels of the lower belly all ſound; the ſtomach was almoſt empty, and, though Mr

Macgill

Macgill carefully ſlit open the guts from one end to the other, there was not the leaſt appearance of worms to be found, nor indeed of any thing elſe, except about two ounces of a glairy ſubſtance, of the conſiſtence of jelly, near the beginning of the jejunum, and a ſmall quantity of ſoft fœces towards the lower end of the colon; the bile was ſomewhat thicker than natural, and of a duſky colour. In the breaſt nothing was faulty, but the lungs, which adhered firmly on all ſides to the pleura, and were full of tubercles and ſuppurated impoſthumes of different ſizes; ſo that, where-ever they were cut, either thin pus ran out, or a thick ſubſtance of the conſiſtence of new cheeſe was found within the membranes of the tubercles. The blood-veſſels of the brain were all greatly diſtended with blood, and in the ventricles about ſix ounces of water were found: The brain itſelf appeared quite ſound.

Before I put an end to this paper, allow me to obſerve, that though the firſt caſe had almoſt all the appearances of an ague the firſt four days, yet it proved a very different diſeaſe, and required very different management afterwards. In its progreſs ſeveral of the ſymptoms gave ground to ſuſpect worms in the lower belly, though none were voided, and there was no opportunity of examining the dead body; but the violence of the fever itſelf, and of the other ſymptoms ariſing from it, was ſo great and of ſuch conſequence, as to leave no place for anthelmintic medicines.— And here it deſerves to be obſerved, That, in almoſt all ſymptomatic fevers, where the ſymptoms are ſtrong, and threaten immediate danger, regard muſt be had to theſe in the firſt place, till their violence abate and allow time and opportunity to remove the particular cauſe by proper medicines. But, on the contrary, where the ſymptoms are not violent nor dangerous, the original cauſe ought to be firſt carried off, and then commonly the ſymptomatic fever ceaſes, either of itſelf, or with very little aſſiſtance.

'Tis remarkable in the ſecond caſe, that, for ſome time before the child's laſt ſickening, he had all the appearances of confirmed health, altho' a ſure and certain cauſe of a *phthiſis pulmonalis* was lodged in his lungs; which undoubtedly would have proved fatal the ſpring following: For neither the tubercles, nor impoſthumes could poſſibly have been formed during his laſt illneſs, which ſcarce allowed time for ſuch a progreſs, and ſhewed not any one ſymptom of either. Hence it appears how little ſecure the event of phthiſical caſes is, even after all complaints ceaſe, till the patient has gone thro' all the different changes of the ſeaſons, particularly ſpring and autumn.

Further, all the ſymptoms of the child's laſt ſickneſs ſeemed to point at worms as the cauſe of the diſeaſe, inſomuch, that nothing was wanting to put the matter beyond doubt except voiding them; which however never happened, nor were there any found upon opening the body. A diſappointment of this kind is no new thing; for all experienced phyſicians know, that every ſymptom commonly produced by worms (except that of voiding them) ſometimes riſes from other cauſes. It is therefore of importance to obſerve, that the method of cure in theſe caſes ought never to be confined to the vermifuga alone; theſe indeed are not to be omitted where the circumſtances will admit of them, as in the preſent caſe; but at the ſame time the chief ſymptoms are to be treated as if they were independent of any ſuch cauſe.

XIX. *Anomalous Appearances of an Ague; by* ALEXANDER MONRO, *Profeſſor of Anatomy in the Univerſity of* Edinburgh, *and* F. R. S.

BY your allowing the caſe I formerly extracted from the records of the Infirmary here a place in your firſt volume of Medical Tracts, I have reaſon to think other examples of hoſpital-practice, if tolerably well choſen, will not be diſagreeable to you. I have picked out the following hiſtory, becauſe of its being ſo near of kin to the one I ſent you laſt year, both being the effects of an ill-managed ague, with ſome anomalous appearances common to them; but at laſt the ſymptoms come out very different: And the manner of their being carried off is ſingular in each, and uncommon in both.

ISABEL DURIE, of a low labouring ſtation of life, was always irregular in her menſtrual evacuations, being ſometimes obſtructed for a whole year together; and was frequently attacked with a vomiting of blood, for which ſhe had uſed a great variety of medicines; but never was relieved till 1727, which was the thirty ſeventh year of her age, when ſhe took ſome purgatives, and had the bloody vomitings only twice ever ſince. In November 1728, after a regular courſe of the menſes, ſhe was ſeized with a quotidian ague, which continued all the winter, and waſted her fleſh and ſtrength greatly. Towards the ſpring the paroxyſms became very irregular, both in their time and type; ſhe had a conſtant nauſea and want of appetite, with pains through all her body. From the firſt attack of the ague her menſtrua ceaſed to flow; nor had ſhe any appearance of them ever ſince that time.

In the ſummer of 1729, ſhe uſed many common cures for her ague, ſuch as vinegar, the roots of the *bellis minor*, *cortex peruvian. &c.* with which ſhe put it off for ſome little time; but always ſoon had irregular returns.

In March 1730, inſtead of ſuffering the common cold and hot fits, ſhe was ſeized with a violent trembling, or rather ſhaking of her arms, or of her head, or of her legs, or of all together; which obſerved no certain period of time, either in their continuing or intermiſſion, but attacked her three or four times one day, then took the form of quotidian, and afterwards intermitted ſeveral days, and ſoon again appeared in ſome of its former ſhapes.

On account of theſe anomalous ſhakings and flying pains in her head, neck, breaſt, and belly, ſhe was admitted into the Infirmary on the 15th Auguſt 1730. Her pulſe was then little altered from the ordinary healthy ſtate, even in the time of the tremblings, which however were ſo violent, that a ſtrong man could not hold one of her hands from ſhaking. Her appetite and digeſtion ſeemed to be good. Her belly did its office ſufficiently. Her urine was in large enough quantity, and of a good colour, without any lateritious ſediment. There were no preternatural ſwellings to be obſerved any where in the patient's body.

When ſhe was firſt taken in, her diſeaſe ſeemed to yield conſiderably, and at laſt to be almoſt cured by the uſe of muſtard vomits † repeated every three or four days, and by taking two drachms of *crude ſal ammoniac* every morning. But, in the beginning of September, the pain of her ſtomach returned, and the irregular ſhakings ſoon ſucceeded; and did not yield to the former medicines. She was therefore ordered frequent and large doſes of the ſtinking gums, galbinum and aſſa fœtida, with ſal. C. C. and an aloetic purgative was now and then given her: Theſe at firſt relieved her, but ſoon loſt their effect, all the ſymptoms returning with their former violence. Her vomits and ſalt were again tried; which failing, ſhe took the hotter alexipharmics, and theſe were ſucceeded by the ſtrengthening ſtomachics: But, though ſhe acknowledged herſelf relieved always for a day or two, on the change of the medicines, ſhe was ſoon as bad as ever.

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† This being a little out of the common road of practice, would be the better to be a little explained. The powder of muſtard ſeed is made into the conſiſtence of a loch, with warm water, in which a little ſea ſalt has been diſſolved. Of this a common ſpoonful, ſometimes two, diluted in tepid water, are given with an empty ſtomach; and operates as well as an emetic, and proves an excellent remedy in moſt of the nervous diſorders. I have ſeen its good effects in the infirmary, and among my private patients ſince I was taught it there.

The phyſicians and ſurgeons being ſo often diſappointed, and her caſe appearing to prove a very tedious, if not incurable, diſeaſe, while recommendations were preſented for ſeveral other diſeaſed people who needed immediate aſſiſtance, ſhe was diſmiſſed on the 8th October.

She lived at Leith after this, where ſhe had no aſſiſtance, but ſometimes came to town here to aſk my advice; by which I became acquainted with the ſequel of her hiſtory. Her tremblings and pains continued in the ſame way, notwithſtanding ſome nervous medicines I gave her, till the middle of December, when her right arm ſwelled conſiderably at the joint of the elbow, with very racking pain, and her tremblings left her. By my advice, emollient pultices of bread and milk, with ſome althea ointment were applied; they relieved her ſomewhat of the pain, but the ſwelling of the joint increaſed, and a ſlow ſuppuration at laſt came on in April following, When the abſceſs was opened a little below the olecranon, a conſiderable quantity of watery pus was evacuated, and ſhe had ſome dreſſings delivered her; but, having no ſkilful hand to apply them, and not being in condition to come frequently to town, her ſore degenerated into two fiſtulous ulcers, which continue ſtill to diſcharge a ſmall quantity of a thin ichor: Her forearm is bended and rigid, with little or no motion in the elbow. But ſhe has been all this time free from the bloody vomitings, flying pains, tremblings, and all other complaints, except the trouble of her arm.

This woman's diſeaſe went off in but a very indifferent manner, ſhe having loſt almoſt the whole uſe of one arm; yet it is the moſt favourable caſe of that kind, that I have either ſeen or heard of among my acquaintances; for no other, of ſeveral whom I could name, under thoſe irregular ſhakings, after an ill managed ague, have at all recovered. I ſaw one who has ſuffered a tedious continued fever, with the advantage of only a few weeks remiſſion from ſhaking.

XX. *Uncommon* Hæmorrhagies *for twenty nine Years; by Mr* PATRICK MURRAY, *Surgeon at* Earlſton,

ISABEL ROBERTSON, living in the village of Earlſton, now aged forty four years, after having had her menſtrua twice at fifteen years of age, was thrown violently on a ſtone, while the third courſe of that natural evacuation was on her; her left ſhoulder was much hurt by the fall, and ſhe ſoon vomited a great deal of blood. Her menſtrua left her before next morning, and ſhe had violent pain in the left ſhoulder and ſide, with great faintneſs and ſickneſs, vomiting blood, and voiding it at the noſe every now and then; which ſhe continued to do every day to the quantity of about half a pound for two years thereafter, the hæmorrhage obſerving no particular time or period, but returning four, five, ſix, or ſeven times in a day: And ſometimes the blood came not only by the noſe and mouth, but alſo by the ears; and ſome appearance, of menſtrua returned every fourth night. During the four ſucceeding years ſhe bled at mouth, noſe, ears, eyes, and uterus, having but ſhort intermiſſions; only that by the uterus was ſometimes ſtopped for ſeven or eleven weeks, which ſhe attributes to the aſtringent medicines which ſhe got in great quantity.

In the ſixth year of her diſeaſe, cupping-glaſſes were applied to her back, and ſtopped the bloodings for ſeven weeks; but this occaſioned a moſt violent pain in her breaſt, which ſwelled ſo much, that it was obliged to be ſcarified a little below the *cartilago enſiformis*.

In the eighth year ſhe was greatly troubled with a ſuppreſſion of urine for eight or ten days, of which ſhe was at laſt relieved, by applying two living toads to her kidneys; what ſhe then paſſed was rather like blood than urine.

In the twelfth year her bloodings were not ſo frequent, they returning ſometimes every fifteen or twenty days, and at moſt twice a week; in which way it has continued theſe ſeventeen years more, only that within theſe two years paſt, ſhe not only bleeds at mouth, noſe, ears, and eyes, and paſſes it by ſtool, but I have ſeen it coming out from her breaſts, and from the roots of the nails of both fingers and toes.

This poor woman has always lived on the loweſt vegetable food, being born of mean parents, and being ſuſtained theſe years bygone by the church-box; nor was ſhe ever ſenſible, that any little change of diet that ſhe has had, either made her bleedings more or leſs frequent, or in greater or leſs quantity. She is ſenſible of little or no pain before the bleedings come on, but knows their approach, by ſtiffneſs in the finger and toe points, and by her becoming dull of hearing. She is ſenſible when eaſt-wind blows, for then ſhe is chill and cold, and it brings on the hæmorrhage, eſpecially at the noſe and mouth. After each hæmorrhage, ſhe is faint and ſick for ſome days. During the firſt twenty years of her hæmorrhagies, ſhe was able in their intervals to walk through the town; but, ſince that, ſhe is for moſt part confined to her bed, and is very wan-coloured, feeble and weak, but has her judgment and memory ſtill entire.

In the firſt years of her illneſs, ſhe got a great variety of medicines, from none of which ſhe found any change, unleſs that ſhe thought the *tinctura antiphthiſica* made her blood thicker, though it did not prevent the hæmorrhage.

For ſeveral years ſhe was let blood of at either arm or ancle, and ſometimes at both, every eight or ten days, and frequently oftner. Now ſhe is bleeded every fortnight or three weeks. She could not obſerve that opening a vein, when ſhe let to the quantity of fourteen ounces, immediately before ſhe expected the hæmorrhage, ever prevented it, or that venæſection ever ſtopped it; but they make it more moderate, which has induced her to continue this twenty nine years in the uſe of it.

All the times that I have let blood of her, it is no higher coloured, or of thicker conſiſtence than water, in which fleſh has been waſhed; and what I have ſeen her evacuate in the hæmorrhagies is of the ſame nature: And ſhe tells me it has not been thicker theſe many years paſt.

Any of you, gentlemen, who happen to come to this part of the country, may ſatisfy yourſelves of the truth of what I have told, for ſhe is very fond of relating her hiſtory; in the mean time allow me to appeal to Mr Monro profeſſor of anatomy at Edinburgh, as a voucher, whom you certainly know and will credit, who has ſeen her ſeveral times, examined herſelf and her neighbours concerning her caſe, and deſired me to draw up this account.

XXI. *The* Dura Mater *oſſified, and other morbid Appearances obſerved; by Mr* JOHN PAISLEY, *Surgeon in* Glaſgow.

IN a man whom I diſſected, February 1732, I found the omentum very much emaciated, conſiſting only of the membranes and veſſels.

The *veſicula fellis* was enlarged as big as both my fiſts; and, from all the trials I could make, the *ductus cyſticus* ſeemed entirely collapſed; I could eaſily paſs a probe from the duodenum, through the *ductus communis cholidochus*, but not into the cyſtic duct; neither could I ſqueeze one drop of the bile from the cyſtis to the gut. Theſe trials confirmed me in the opinion, that that duct was grown together, and hindered me from trying it by injection, which ought likewiſe to have been done, to put it paſt diſpute. Upon opening the veſica, I found that it contained a great quantity of a duſky-coloured bile, with many ſmall black ſtony concretions, though none of them were in the duct; nor could I then diſtinguiſh the place where the duct made its exit from the cyſtis. The liver was a little ſcirrhous, and of a conſiderable bigneſs.

The ſpleen was likewiſe very large, and adhered ſo firmly to the diaphragm, that it could not be ſeparated from it, without a conſiderable force.

The heart was very large and flaccid; the left ventricle conſiderably larger than the right, and its ſides at leaſt as thin: The reaſon of which I could not ſo well underſtand or explain, unleſs it were owing to a ſmall hole obſervable in two of the ſemilunar valves in the mouth of the aorta, ſo big, as eaſily to allow a large probe or ſmall crow-quill to paſs them, by which, in the contractions of the aorta, when theſe valves were thruſt back, ſome of the blood might regurgitate into the ventricle. The upper limbus of one of the valves was cartilaginous; in another there was a ſmall cartilaginous ſubſtance about the bigneſs of a coriander ſeed, not perfectly ſpherical, but a little angular.

After removing the cranium, and cutting up the dura mater upon each ſide of the falx, in order to take out the brain, I found ſome hard bodies in the falx, which I thought at firſt were ſome ſtony concretions; but, upon examination, found they were bones. On the right ſide there were four of them of the ſame dimenſions and figures, as in the annexed Tab. III. fig. 1. E E E E, ſtretching out ſharp pointed ſtriæ every way, a ſmall part of the three anterior, which are the largeſt, being formed in the falx, the reſt of them in the *dura mater* of that ſide, D D D, which in the figure appears folded up, to be in a plain with the falx. There was no appearance of any of thoſe bones upon the external ſide of the *dura mater*.

A little farther forward in the falx, near its anterior part, was a large bone, more than an inch and a half in length, and a large half inch in breadth, very protuberant on the right ſide, and angular at M, with ſharp-pointed ſtriæ all around, eſpecially at its anterior part. This appeared likewiſe on the other ſide of the falx, but not half ſo large; the whole of that membrane on the left ſide not being oſſified, oppoſite to the bone, but only the part F, as in fig. 2. It was not protuberant on this ſide, but rather a little hollowed. On this left ſide, appeared another bone K, diſtinct from theſe on the right, and lying in the ſame manner in the falx and *dura mater*.

A little further forward, near the attachment of the falx to the *criſta galli*, is another ſmall bone, G, equally conſpicuous on both ſides.

Though I could not procure ſuch a diſtinct account of this man's life and malady as might be neceſſary to illuſtrate the foregoing hiſtory, I have ſent it to you, gentlemen, that if you think the communicating thereof to the world may be of any uſe, you may do it; if you don't think it proper to give it a place in your collection, you may throw it aſide.

Scribere te nobis, tibi nos accredere par eſt.
HOR.

All I have heard with reſpect to him, was, That he had been a ſoldier, was many years abroad, but has been in this country again more than twenty years, did not complain much of head-achs, was no great drinker, neither was much indiſpoſed, till about ſix weeks before his death, that he took a fever and after it a jaundice, of which he died.

The figures are drawn very exactly from the dried falx (which I have ſtill by me,) by Mr William Robertſon limner.

TAB. III. Fig. 1.

AAAA, The *ſinus longitudinalis ſuperior*.
BBBB, The *ſinus longitudinalis inferior*.
C, The fourth *ſinus* of the *dura mater*.
DDD, Part of the *dura mater* of the right ſide turned up, ſo as to be in a plain with the falx, that the four following bones may be ſeen.
EEEE, Four ſmall bones, the three anterior being the largeſt.
F, The large bone in the falx, very protuberant and angular at M, being more than half an inch thick at this part.
G, Another ſmall bone equally conſpicuous on both ſides.

H, The ſecond proceſs of the *dura mater*.
L, The anterior part of the falx, where it takes its riſe from the *criſta galli*.

Fig. 2

AAA, The *ſinus longitudinalis ſuperior*.
BBB, The *ſinus longitudinalis inferior*.
C, The fourth *ſinus* of the *dura mater*.
DD, Part of the *dura mater* of the left ſide turned up, that the following bone may be ſeen.
K, A ſmall bone on the left ſide.
F, The appearance of the large bone in the left ſide of the falx.
G, The ſmall bone in the falx equally viſible on both ſides.
H, The ſecond proceſs of the *dura mater*.
L, The anterior point of the falx.

XXII. *A Conſumption and Dropſy of the Breaſt, from a Wound too haſtily cloſed; by Dr* GILBERT WAUGH, *Phyſician at* Kirkleathem *in* Yorkſhire.

ARTHUR CAYLEY, a young gentleman about fifteen years of age, was of a weakly conſtitution, a bilious temperament, and frequently ſubject to the jaundice.

It happened unluckily, about three months before his death, as he was running to ſchool, with a penknife in his hand, that he fell, and thereby received a wound about an inch below the nipple of his right breaſt; thence iſſued a ſmall quantity of blood before the ſurgeon came, who, judging the wound altogether ſuperficial, did without heſitation heal it up, though the ſymptoms plainly indicated that the hurt was deeper; for the patient inceſſantly complained leſs or more of a pain in his breaſt, which was ſometimes ſo violent, that he could neither laugh nor cough without torture; nor could he inſpire fully, without the greateſt uneaſineſs; ſo that his neighbours judged him in a lingering condition; and with pity obſerved him going off by a gradual conſumption, without a violent cough or purulent ſpitting. The ſymptoms of his diſeaſe were, perhaps, more gentle, that he naturally loved, and always uſed a milk diet.

I was called only four days before his death; at which time he complained conſtantly of an acute pain in his left ſide, about the ſituation of the diaphragm, and of an unſupportable anxiety and difficulty of breathing, an intenſe heat within his breaſt, an unquenchable thirſt, and exceſſive coldneſs of the extreme parts; his eyes were dim and cloudy as in the laſt ſtruggles; his urine variable, ſometimes letting fall a light ſlimy ſediment, but for the moſt part pale, with none; his pulſe weak, ſlow, and ſometimes intermitting; he had a tenſion of the hypochondria, and ſtomach, and cold ſweats about his head and breaſt; all which ſeemed to intimate death inevitable. However, that I might in ſome meaſure anſwer the importunity of my patient's mother, I was obliged to preſcribe, though with ſmall hopes of ſucceſs. The preſent ſituation of affairs abſolutely forbad bleeding, and there was ſcarce any other mean left, but to attempt to give to him ſome ſmall relief by a pectoral decoction for drink, the inſpiration of the fumes of the ſame made warm, and mixed with vinegar and ſome other pectoral medicines uſually preſcribed in ſuch caſes. Veſicatory plaiſters were likewiſe applied to the extremities. In a few hours his cough (which before had given little trouble) growing more frequent, flattered us with hopes of a ſucceeding expectoration; but they were found groundleſs. The pain in his ſide alſo apparently yielded to a fomentation; but the other ſymptoms not only remained, but increaſed, till death put a period to them all.

Having obtained liberty to open the body, I obſerved the ſkin on the left ſide appeared blotted, and diſcoloured in a very ſingular manner. The teguments of the breaſt being laid aſide, the firſt thing that ſtruck my eye was the callous veſtige of the wound, clearly demonſtrating the progreſs of the knife into the cavity of the thorax. Having then raiſed the ſternum, I found that the pleura on the right ſide was much thicker than natural, and in ſome places almoſt cartilaginous, ſtrictly adhering to the ribs. I found alſo, at the veſtige of the wound, a remarkable coheſion of the lungs to the pleura. Having ſeparated the right lobe of the lungs, there appeared at the part adhering to the pleura, a hard ſcirrhous lump almoſt as big as a walnut, under which I diſcovered a large collection of pus, which had alſo made its way into the other lobe of the lungs.

In the left ſide of the thorax was contained water to the quantity of eight pounds, in which did ſubſide a thick white water, not unlike half-melted ſuet.

Having removed the water, I found the left lobe of the lungs not the bigneſs of my fiſt, and no way reſembling the ſubſtance or figure of lungs, but a putrid lump. The pleura on this ſide was quite waſted.

The heart with its veſſels was very ſmall, void of blood, on all ſides firmly attached to the pericardium.

The colour of the liver was good, but its ſubſtance ſomewhat harder, and the ſize larger than natural.

The gall-bladder was turgid with bile, whoſe colour was not a laudable yellow, but much inclined to black.

XXIII. *An* Aſthma *accompanied with Palpitation and flying Pains of the Breaſt and Shoulder; by Dr* Robert Lowis, *Fellow of the College of Phyſicians at* Edinburgh.

A healthy boy, about four or five years of age, after playing among wet graſs, was ſuddenly ſeized in the night with a ſuffocation; of which he was immediately relieved by a plentiful blood-letting at the arm: But ever after was obſerved, when ſpeaking much, or at his diverſions, not to have ſo free and long breathing as uſual.

In November 1721, being then about eleven years of age, he was affected with a pain of his right ſhoulder and breaſt, which gave him great uneaſineſs in breathing: His pulſe at firſt differed not much from what it uſed to be in health; but, in the progreſs of his diſeaſe, became feeble, frequent, and unequal. He had ſome cough, but not very troubleſome; his appetite for food was little, and his thirſt moderate: His urine was generally in ſmall quantity, of a reddiſh colour; and, when it did ſeparate, let fall a copious brown ground. Towards the end of his illneſs, he had a pulſation at the pit of his ſtomach, but not ſo conſiderable as in the two following returns of it. He had a ſwelling of the teſticles and ſcrotum, and of his legs, chiefly towards evening; at which time alſo his pains were moſt violent, and often obliged him to lie upon his elbows and knees, in which poſture he always found moſt eaſe.

The remedies uſed were repeated blood-lettings, to the amount of forty ounces, in leſs than three weeks, by each of which he was ſenſibly relieved; but the pains always returned in three weeks, four or five days: All his blood was ſizy: He took ſeveral vomits and purges, infuſion of ſtone-horſe dung, *ſperma cetæ*, with volatile ſalts, expreſſion of hog-lice, and other medicines, to the ſame intenſion. He had alſo externally ſpirituous liniments. And, laſt of all, his pains ſtill returning, he took forty or fifty grains of ſweet-mercury in ſmall doſes; which, without ſalivation, ſoreneſs of mouth, or any conſiderable evacuation, freed him of his pains and other ſymptoms, after ſix or ſeven weeks illneſs.

In June 1723, he had a ſecond return, only in this the ſymptoms were more uneaſy. Blood-lettings had no better effect than before, and for that reaſon were not ſo often repeated: Mercury given as formerly had not like ſucceſs. Tepid baths, with cupping and ſcarifying where the pain was moſt afflicting, gave ſome relief; the pain and other ſymptoms yielded gradually, and, the ſeaſon of the year favouring, by the help of aſſes milk, and moderate exerciſe on horſeback, after two months illneſs, he recovered.

The third and laſt return was about the beginning of September 1724: The ſymptoms were ſtill worſe than in the former: Bloodletting three or four times repeated gave but ſhort relief, mercury none at all; the pulſation at the pit of the ſtomach became much more obſervable; there was a conſiderable tenſion in the region of the ſtomach and right hypochonder. About a week before his death, he complained of a ſlight dull pain in theſe parts, but had no vomiting, nor ſigns of greater fever than before; his legs ſwelled to a vaſt bigneſs, his face alſo ſwelled, but the reſt of his body was much emaciated; his breathing was very laborious, with a ſhort cough, and little expectoration. What he did ſpit up with much trouble, as he drew near his end, ſeemed to be a browniſh pus, mixed with a little blood. With theſe ſymptoms his pains continuing, made his former poſture of lying upon elbows and knees afford him little relief; the moſt he had was ſtanding with his arms leaning upon the back of a chair, or ſitting with his breaſt and arms leaning forward upon pillows laid on a table. And in this poſture he died October 18th.

Upon the 20th his belly was opened.

1. In the lower belly the ſtomach was found much diſtended, and, upon the bottom of it towards the left ſide, there was a mortification about the breadth of the palm of a man's hand.

2. The liver was very large, but otherwiſe ſound.

3. In the thorax, the lungs were attached to the pleura in two or three places, otherwiſe they were pretty ſound.

4. The whole ſurface of the heart was as cloſely united to the pericardium as to its own proper membrane, and each of its ventricles was capable of containing a gill of liquor.

XXIV. *A Tumor in the* Oeſophagus, *hindering Deglutition almoſt entirely; by Dr* FRANCIS PRINGLE, *late Preſident of the College of Phyſicians at* Edinburgh.

IN the year 1712, a gentleman of a robuſt healthy conſtitution, and in the flower of his age, after hard drinking, eſpecially of ſpirits, was ſeized in the month of May, with a throwing up of every thing he eat or drank, and that without pain, violent reachings to vomit, previous ſickneſs or nauſea; but, the moment he ſwallowed meat or drink, almoſt before it entered the ſtomach, it was returned again as if he had ſpit it out of his mouth only. This ſymptom, however ſlight and inconſiderable it appeared at firſt in one of his age and ſtrength, eluded the force of a great variety of medicines; vomits, ſtomachic purgatives, bitters, and ſtrengtheners, chalybeates, mineral waters, aſſes milk, teſtaceous powders, &c. were all preſcribed in their turns, to no purpoſe. The diſeaſe, ſtill continuing obſtinate, began ſoon to be attended with a daily and gradual decay of ſtrength and fleſh, and a conſtant chillneſs, even during the ſummer ſeaſon; till at laſt he was brought into a perfect maraſmas and atrophy, in which condition he died in October following, never having any other ſymptom than thoſe mentioned.

His body being opened, there was a hard glandular excreſcence found in the cavity of the oeſophagus, continued from the middle of this canal to the upper orifice of the ſtomach, filling the whole cavity ſo much, that a probe could ſcarce be thruſt down to the ſtomach.

XXV. *Difficulty of ſwallowing, loſs of appetite,* &c. *from ſcirrhous tumors in the* Oeſophagus *and Stomach; by Dr* JOHN TAYLOR, *Fellow of the College of Phyſicians at* Edinburgh.

—————————Aged thirty four, of a ſlender habit, but of a very healthy conſtitution, complained, for almoſt a year, of a pain frequently attacking him under the xiphiod cartilage, without uſing any medicine: After this, upon getting for ſome time his diet very irregularly, he loſt his appetite and digeſtion; for which he was adviſed to try ſteel, ginger, and pepper mixed. Having continued the uſe of this powder three or four weeks without any benefit;

but, on the contrary, his ſymptoms growing every way worſe, and his body waſting conſiderably, he aſked my advice, about the end of November laſt. His complaints then were a decay of fleſh, ſtrength, and colour, a great difficulty for moſt part in ſwallowing any ſolid food, which, after paſſing eaſily enough to near the mouth of the ſtomach, met there with great reſiſtance, being ſenſibly compreſſed, and occaſioning much pain before it got further down; and frequently the deſcending bolus was violently ſqueezed back into the fauces from this part, while ſometimes, though ſeldom, it could get without any impediment into the ſtomach; whence he commonly was ſoon obliged to ſpout up again his victuals, with a great deal of phlegm. He had however little or no trouble in ſwallowing or retaining liquids or thin food, provided he ſwallowed them ſlowly. He alſo complained much of a conſtant girding acroſs the lower part of the epigaſtric region. He never had been ſenſible of his receiving any hurt, neither was there any external pain or tumor felt; his pulſe was full and good; he ſlept well, had no thirſt or ſweats; his urine was in a natural enough quantity, but crude; he was generally coſtive, and much troubled with belching and borborygmi.

I flattered myſelf that his ſymptoms were moſtly nervous; and therefore reſolved to cleanſe the *primæ viæ* firſt; and then to preſcribe him corroborant medicines, with ſome of the milder antihyſterics.

Doſes of ipecacuan in ſubſtance and infuſion, though larger than ordinary, and aſſiſted by carduus tea for drink, had no effect on him: But the *tinctura ſacra* and *rhubarb. compoſit.* anſwered very well as purgatives; and he got pills compoſed of the ſofter gums, rhubarb and *extract. fl. chamæmeli*, in a few ſpoonfuls of an antihyſteric julep; by the uſe of which, with gentle bitter ſtomachic infuſions, an eaſy, nouriſhing diet, and proper exerciſe, his appetite and digeſtion became better in a few days: I added ſoon a little ſoap to the pills, and ſome compound ſtomachic waters to the julep; and, in ſome time after, I mixed ſteel with the former, and diſſolved a little *aſa fœtida* in the latter, and applied the antihyſteric plaiſter to the epigraſtic region; by which means he recovered his appetite, fleſh, ſtrength, and colour, and his girding became eaſier; but ſtill the complaints in ſwallowing remained, as well as the ſpouting up his food, with great quantities of phlegm: To remove this, I gave him *oxymel ſcillitic.* and afterwards *vini emet. drach.* x. but could procure only ſome weak attempts to vomit, which brought up nothing.

Towards the end of December, he was violently ſeized with a nephritis in both kidneys, attended with a total ſuppreſſion of urine; which kept him five days in a very miſerable condition, notwithſtanding all the ordinary evacuations, bathings, diuretics, &c. proper in that diſeaſe, till at laſt he paſſed a ſtone that had come down from the right kidney. But this ſhock left him much weaker, and made all the complaints of his appetite, deglutition, and digeſtion worſe than ever, ſo that he could bear no ſolid food, and his medicines were all thrown back, except a medicated ale in which bitter ſtomachic and diuretic materials had been infuſed.

Upon my deſiring aſſiſtance, Dr Francis Pringle, late preſident of our college, was conſulted. We ordered ſome *fl. ſulphuris* to be taken in milk every morning, and renewed the gummous pills, with ſoap and *balſam peruvian.* which he continued to uſe till the beginning of February, without any relief, about which time the patient obſerved, that if he eat bread with any liquors, he was ſure to throw all up; which did not happen, if he firſt eat the bread, and ſome time after drank the liquors.

Next we preſcribed riding, *æthiops mineral*, and a decoction of the *pareira brava*, with ſome *tinctura martis in vino Rhenano*, which he took a conſiderable time to no purpoſe, his ſymptoms turning worſe, his body waſting apace, and his pulſe becoming quicker.

About the middle of March he began to have morning ſweats, without any cough or groſs ſpitting; ſoon after which, as he was walking in the fields, he brought up two polypous-like ſubſtances, in the ſame way as he uſed to do his food; one of theſe was of a firmer conſiſtence than the other, but was pretty much putrified at its extremities. They both reſembled a piſtachio nut in figure and bulk, only they were about a third longer. Immediately upon their coming away, he felt a ſharp pain in his breaſt, which continued conſtant four days, he taking in the mean time *aq. calcis* in milk, and a mild healing electuary. In a fortnight after, he brought up a third ſubſtance, like the two former, but without feeling any pain at the time, or after; neither did he evacuate any thing bloody by the mouth or by ſtool at either time. After the coming away of this third body, he had no more night-ſweats.

We then forebore giving medicines, and only recommended a milk diet, and moderate exerciſe.

After the middle of April, he found veal, young pigeons, and ſuch like, do much better with him than the thin food which he could only bear formerly.

In the beginning of May he underwent a gentle ſhort fit of the nephritis in the right kidney, and then began to be ſenſible of a hardneſs in the left hypochondre, which he always complained of from that time. Soon after this a diarrhœa, with whitiſh-coloured ſtools, came on; we could not ſtop it, and he decayed faſt: So that he died before the middle of June, greatly emaciated, but perfectly diſtinct in his ſenſes and judgment.

His body was opened at my deſire, in preſence of Mr Monro profeſſor of anatomy, by Mr George Young ſurgeon-apothecary, who had attended him during all his ſickneſs.

Upon cutting the teguments of the abdomen, the lower edge of the omentum, which was very ſhort, was ſeen grown to the peritonæum from one ſide to the other of the lower part of the *epigaſtric region*. The omentum was thin, but hard and firm, at the place of this attachment; which being cut, and the teguments laid back, it was likewiſe ſeen adhering to the inteſtines in ſeveral parts, being every where ſcirrhous and vaſtly thick where it adhered to the liver, ſpleen, and ſtomach; the two former being firmly connected to the laſt by it. In cutting away the omentum from the other bowels, we diſcovered a great many little abſceſſes in its ſubſtance. The ſurface of the liver, ſpleen, and ſtomach had ſmall white tubercles ſcattered over them, excepting which, ſo much of the ſtomach as was then in ſight, appeared natural enough, only its dorſum adhered every where very firmly to the diaphragm, by means of a hard ſteatomatous or ſcirrhous ſubſtance like to that of the omentum.

The inteſtines ſeemed a little inflamed in ſome places, and were grown more than uſual to the peritonæum.

The kidneys and *veſica urinaria* contained no ſtone, contrary to what we expected.

All the other viſcera of the abdomen were ſound.

When the thorax was laid open, we took ſome bloody water out of each cavity. The lungs appeared ſound, only the inferior lob of the left ſide adhered firmly to the diaphragm; where, when we were ſeparating it, we diſcovered an abſceſs containing ſome pus and a viſcous brown fluid, exactly like to what was found in the ſtomach afterwards. The cavity in the lungs was not larger than to receive two ounces of liquor; but from that the abſceſs penetrated through the diaphragm and coats of the contiguous ſtomach into its cavity; the perforation in the diaphragm and ſtomach being large enough to allow one's thumb to paſs.

The oeſophagus was ſound till within two inches of the diaphragm, where it degenerated into a white thick ſcirrhous ſubſtance in which there were a great many ſmall ſuppurations, each of which opened into this canal. The ſuperior orifice and ſubſtance of the ſtomach, for ſome inches below, were much in the ſame condition; ſo that, the *par vagum* being here compreſſed, this bowel might probably have been rendered ſo inſenſible, as not to be moved by the ſtrong emetics which had been given him.

The glands at the diviſions of the *trachæa arteria* were infarcted with a ſpongy ſtony ſubſtance, incloſed in a very firm black membrane.

All the other parts were in a natural ſtate.

XXVI. *An Account of an extraordinary Worm; by Mr* JOHN PAISLEY, *Surgeon in* Glaſgow.

IN February laſt, a young man was wounded in a duel with a ſmall ſword, which entered about four inches below the right nipple, and a little towards the back; by probing the wound, we found it reached four inches ſlanting downwards betwixt the teguments and the ribs, without any ſigns of its penetrating, tho' all the different ways to diſcover it were tried, as probing, injection, &c. He told us he was in his utmoſt longe, when he got the wound, and ran upon his antagoniſt's ſword, who having both a much longer arm and ſword than he, and being taller, had dropped the point of it a little, otherwiſe it was not poſſible to ſee how he could have got ſuch a wound.—He loſt a conſiderable quantity of blood, by which, after he had walked off the field for a conſiderable way, he turned faintiſh; when he held his hand upon the wound, he could eaſily ſtop the bleeding; but the pain ſoon obliged him to take it off, the blood guſhed out for a little briſkly, then ran trickling down, as from any ſuch ſmall wound in the teguments. When he fainted, it was upon a ſtair-caſe, early in the morning, where he lay above an hour, with nothing upon him but his ſhirt and riding coat. At firſt the wound was dreſſed with dry dreſſings, the blood eaſily ſtopt; and, by a gradual compreſs, and the ſcapulary and napkin, it was bandaged up. In two or three days, the ſuppuration ſucceeded well, it healed up in eight or ten more.

The third day at night, after he had received the wound, he complained of a violent pain in the region of the ſtomach, and in the back oppoſite to it; but none near any part where the wound was, and had ſome reachings to vomit; upon which I was afraid leſt the ſword ſhould have ſlipt through below one of the ribs, and pierced through the diaphragm, and touched the liver, though he had none of the other ſigns of theſe parts being wounded. He was confined to a low diet from the beginning, and having a great cough before he was wounded, which, no doubt, was increaſed by his lying ſo long on a cold ſtair almoſt naked, he was ordered proper linctuſes, apozems, &c. by Dr Briſbane, who was the phyſician that attended him, and an anodyne draught at bedtime. His pulſe was a little quick, the firſt three days; but, on the fourth, the pain in his back was entirely gone, as was the fever, and the pain in his ſtomach was much abated: He complained of no drought, nor of any other uneaſineſs, but of the cough and the pain in his ſtomach, which recurred frequently in the night-time, and eſpecially towards the morning. About the fourteenth day from his receiving the wound, he was attacked with ſome aguiſh fits, and profuſe ſweatings, without any regular appearance; ſo that it could not be reduced to any kind of intermitting fever; and ſometimes was thrown into ſtrong convulſive fits, though he ſaid he never had had any ſuch all his life before.

About the 15th of March, all terminated in a jaundice, for which the phyſician ordered proper medicines, by which it went off in ten days, when he recovered his colour again, and did not complain ſo much of the pain in his ſtomach; he had got little or no paſſage by ſtool from the time he firſt complained, without the help of clyſters; but, on the 24th of March, he took a kind of looſeneſs, and paſſed a great quantity of fœces, which looked like boiled blood, and ſome pure blood, complaining much of the pain in his ſtomach.

On the 26th, he paſſed a large worm, a foot and a half long, and an inch and an half diameter, when the draught of it, which I ſend you along with this, was taken by Mr Robertſon the limner, before ſeveral of the maſters of the univerſity. It had been conſiderably larger at firſt; but ſo ſoon as he had paſſed it, (which he could not do till one, in whoſe houſe he ſtaid, pulled it from him) he was ſo much ſurpriſed at it, and afraid that it had been one of his inteſtines, that he ſaid he cut off about an inch of its tail, and gaſhed in one or two places with a knife, to ſee what was in it, by which a great deal of blood ran from it; as there did alſo after it had been waſhed ſix or ſeven times in water. He loſt a great deal of blood along with it, to appearance ſome pounds, and for ſeveral days paſſed ſome grumous blood.

The worm was dead when he paſſed it; and made up of a great many rings like the earth-worm; the interſtices between each joint were rather larger than as they appear in the figure, and were of a dark chocolate colour; the joints themſelves more pale, or rather of a livid fleſh-colour: The head was conſiderably ſmaller than the body, though made up of joints, and very much reſembled a duck's bill. It was flatter on the under-ſide, with a kind of band, running all along from the neck, which joined the head and body together to the tail, into which all the rings and joints ſeemed to terminate, reſembling pretty much the one that runs along the upper ſide of the colon.—It had a triangular mouth like the horſe-leech. After he paſſed it, he ſtaid in this place till the 26th of April, when he ventured on a journey to Ayr, and grew gradually better, though frequently complaining of pains in the region of the ſtomach all the time.—— From Ayr he writes he has paſſed another, rather larger than the firſt, but it came away all in pieces.

I have no author who gives an account of any ſuch worm, only Dr Daniel Clerk, in his *Hiſtoria Latorum Lumbricorum*, *cap*. xiii. *, that ſection where he treats of the *res inanimata vermibus ſimiles*, reprehends Maroja, phyſician to the King of Spain, for relating the hiſtory of ſuch an one. His words are, "Verum craſſius "etiam allucinatus eſt Cyprianus Maroja, Phi- "lippi Quarti Hiſpaniarum regis medicus, cu- "jus hæc ſunt verba †: Quidam æger, qui per "infernam alvum ejecit lumbricum mortuum, "& ſimul cum ipſo vitam amiſit. Erat tamen "lumbricus longitudinis viginti digitorum, & "rotundus, & in rotunditate æquabat magnitu- "dini carpi manus hominis robuſti. Erat ſan- "guine plenus; & in vaſe teſtaceo immiſſus, "facta ſanguinis expreſſione, rejecit a ſe plus "quam unam ſanguinis libram cum dimidia," &c.

TAB. IV. Fig. 1. ſhews the upper ſide of the worm.

A B C D, The head.

C D, The neck by which it was joined to the body: The ſmaller rings repreſent the hollows formed by the joining of the protuberant annular ſurfaces.

Fig. 2. Repreſents the under ſide of the head, and two rings of the body.

A

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* Pag. m. 280.

† De morbis internis, lib. 4 cap. 16.

A B C, Its triangular mouth.

D E, Part of the band that runs along the whole body on its under ſide.

XXVII. *Inability of Coition from the Piles; by* WILLIAM COCKBURN, M. D. *Fellow of the Royal Society, and of the College of Phyſicians of* London *and* Edinburgh.

A Woman related to one of the moſt eminent midwives in this place, had ſuch an intolerable pain when ſhe had any commerce with her huſband, as rendered the action impracticable. The midwife having a great opinion of the late Dr Hugh Chamberlain, deſired his aſſiſtance for this unhappy woman. He judged her caſe to be a cancer of the womb, and ordered her what he thought beſt for her relief. She was frequently purged, made uſe of fomentations, beſides alterative medicines.

This method was continued for ſome time; but finding no relief that way, Sir David Hamilton was afterwards adviſed with; and, no eaſe coming from that quarter, my aſſiſtance was deſired.

The unfortunate woman made no great complaints of pain, but in the time of coition. Mrs Cotton examined the womb, and could not find any diſcharge from it, nor any hardneſs, ſcirrhus, or calloſity about the neck of the womb. Now, as that part appeared to be blameleſs, I found ſhe was troubled with the inward piles; and they were kept much upon her, with the purging and other adminiſtrations; I ſuſpected that the pain in coition proceeded altogether from preſſing the piles, when the penis ſtretched out the vagina.

On that view, I attempted the cure of the piles, and with ſo great ſucceſs, that at once ſhe was cured of her diſeaſe, and admitted of the embraces of her huſband, without any further complaint: So neceſſary it ſometimes is to attend minutely to the ſituation of parts as well as the ſuppoſed affection, or methods of cure.

XXVIII. *Jaundice from Concretions; by Dr* THOMAS SYMPSON, *Profeſſor of Medicine in the Univerſity of* St. Andrew's.

THE hiſtories of icteric caſes, which confirm the account of the jaundice depending moſt frequently on concretions lodged in the biliary ducts, as is argued for in Art. XXXIII. of your firſt volume: Such hiſtories, I ſay, are to be met with in great numbers in obſervators; but are generally told ſo ſuperficially, that they ſerve very little to explain the phænomena of the diſeaſe: And therefore the following caſe I hope will not be unacceptable; ſince it illuſtrates pretty accurately a general doctrine which you have thought to merit the attention of the public.

Mrs Forbes, aged about forty, the mother of ſeveral children, of a ſanguine conſtitution and ſedentary life, about the beginning of April awaked in the night with an acute pain at the *ſcrobiculus cordis*, and part of the back oppoſite it; a quick, hard, and full pulſe, great ſickneſs, inſatiable thirſt, exceſſive heat; no food, however mild, ſtaid upon her ſtomach; without taking any thing, ſhe had frequent reachings and vomiting. The blood, which was let plentifully from the arm for theſe ſymptoms, was rheumatic to a great degree. The fourth, fiſth, and ſixth days of her trouble ſhe raved, had the hiccup, and fainted frequently. The three following weeks, wherein ſhe was often bled and received clyſters, as ſhe had done from the beginning, the ſymptoms became eaſier; but, about this time, we obſerved her whole body coloured with a deep yellow, and that every thing put into her urine, came out coloured the ſame way, while what ſhe paſſed by ſtool was white: This determined me to venture her with a purgative infuſion of ſenna and rhubarb; after which we obſerved her ſtools for ſome days coloured, though the ſkin was little changed, and all the ſymptoms abated. Shortly after they made a new attack upon her, attended with vomiting, pain at the ſcrobiculus, a ſmall uneaſineſs at the region of the liver, univerſal itching, feebleneſs, and oppreſſion without the fever, and other ſevere ſymptoms which took place at firſt; the potion was again adminiſtrated with the ſame obſervable ſucceſs as formerly; but, ten days after, a third attack of the ſame nature with this laſt was made; which yielded nothing to the phyſic, though ſeveral times repeated; wherefore I now ordered her pills of Venice ſoap and aloes, equal parts, to be taken gradually till they ſhould produce a looſeneſs: Upon their operating, ſhe was ſenſible of a pain ſtriking from the region of the gall-bladder towards the *linea alba*, as ſhe had frequently felt before, and accidently viewing her ſtools, ſhe found them bilious, with ſome kind of compact diſtinct bodies ſwimming in them, moſt of them bigger than peaſe; nine were found at this time, and as many the next day, the purging being ſtill continued; and now the ſymptoms greatly remitted, but returned again in a few days; in which fit, continuing her looſe belly, ſhe paſſed two of the ſame bodies; and in a following fit, which was a few days after, four: And we obſerved, that every time the ſymptoms remitted, the ſtools were bilious.

After theſe, ſhe had full three weeks interval, with conſiderable eaſe; but then ſhe had one of the worſt fits ſhe ever had, except the firſt, ſhe being feveriſh, and vomiting under it, &c. I being from home, ſhe got nothing untill the third day, wherein ſhe took her pills, purged, but nothing appeared; next day ſhe rode to no purpoſe; the fifth day her pills were repeated, ſhe purged, and paſſed a ſtone as large as a bean, of a priſmatic figure, impreſſed on one ſide, as if another ſtone had been adhering to it, which I found to be the caſe of ſeveral ſhe had formerly paſſed: After which ſhe continued ſometimes riding, purging, bathing in warm water, and has now recovered her health, without any further moleſtation from the jaundice.

The ſtones paſſed were of a brown colour, finely poliſhed; ſo that they felt ſmooth, and oily like ſoap: They differed much in figure,

gure, and were all angular and irregular, except two, one of which was of a priſmatic figure, as above, and the other exactly triangular, with two equal ſides; when divided, they appeared compoſed of different cruſts, though theſe were not perceptible near the middle: They were bitter to the taſte; and (except ſome of the biggeſt, which equalled a hazel-nut) they all ſwam in freſh water, the biggeſt deſcended ſlowly. The number we got in all was twenty ſix; but we ſuſpected ſeveral beſides had paſſed in the firſt fits, before the ſtools were examined; and we reckoned not without ſome reaſon, ſince we never found the fit to yield afterwards without meeting more or fewer of theſe concretions.

XXIX. *Jaundice with Suppuration of the Liver; by Dr* James Dundas, *Fellow of the Royal College of Phyſicians in* Edinburgh.

A Gentleman of a thin habit of body had been thrice ſeized with the jaundice, from the forty fifth to the fifty ninth year of his age; this diſeaſe being each time preceded, for ſome months, with ſharp deep-ſeated pains of the epigaſtrium, which began three or four hours after eating, eſpecially after ſolid food, and continued an hour or longer.

Theſe pains were for moſt part uneaſy to him while the jaundice remained, which was near a month, but decreaſed as the diſeaſe went off; though, for two or three weeks thereafter,

after, a full meal of ſolid food uſed to occaſion a return of the pains.

From the laſt attack of the pains, which happened about ſeven months before his death, his fleſh waſted conſiderably, without any diminution of his ſtrength, till the jaundice had its ordinary courſe; ſoon after which, the patient having gone to the country in the month of March, and having uſed much exerciſe there, enjoyed very good health for ſix weeks.

Towards the end of April, after having rode ſome miles in a very cold day, he felt a conſtant internal pain in the right hypochondriac region and in the epigaſtrium; which laſt increaſed upon eating ſolid food.

Theſe he did not much regard, but took an Anderſon's pile, which he commonly uſed when coſtive. This purgative occaſioned a diarrhœa, which confined him ſome days to the houſe.

The looſeneſs being ſtopped, he rode out after dinner, on the fifth day after the beginning of this relapſe, the weather being very cold. At his return home, the pains were much more violent, and were attended with a great heat and thirſt, difficult breathing, an ill taſte in his mouth, want of appetite, with a ſickneſs, as he called it, ſometimes in his ſtomach; and he could not ſleep at night.

Next day, the jaundice appeared, and, the former ſymptoms having increaſed, he was confined to his bed.

The ſymptoms became ſtill more violent the two following days; and on the ſecond of them his pulſe intermitted, and he had a ſevere cold fit, with great trembling, both evenings.

Next morning, which was the ninth day from the firſt attack of the diſeaſe, I firſt ſaw him, his pulſe was ſtrong, full, a little frequent and intermitted at the eighth, twelfth, or ſixteenth ſtroke: his breathing was quick, but leſs difficult than it had been; his ſkin was very warm, and he complained of very great internal heat. The pains were much abated, and ſcarce troubled him, except at a large inſpiration. The pain in the right hypochondre was ſharp, upon lying on the left ſide. He had ſometimes a pain about the right clavicle, which he told me had been more frequent the day before. He was ſenſible of a weight in the right hypochandre, and his ſtomach was much oppreſſed by every thing he ſwallowed. His urine was in ſmall quantity, very high-coloured, and ſoon became turbid. The colour of his ſkin was not ſo yellow as it had been: I cauſed eight ounces of blood to be let, which ſoon was covered with a thick inflammatory cruſt of a yellow colour. I then ordered him to take every hour two ounces of an aperient decoction, a little warm, and to waſh it down with a ſpoonful of a mild acidulated cordial mixture. At night, I preſcribed a gentle hypnotic draught, which procured him ſleep all night.

On the tenth he was again bleeded, and his blood had the ſame appearance as formerly. The draught having been neglected this night, he did not ſleep well.

When I viſited him again on the eleventh, he complained of a pretty ſharp pain in the right hypochondre, but the other in the epigaſtrium ſeldom was uneaſy to him. The heat of his ſkin was much leſs, though he affirmed the internal heat was much the ſame. He had ſome appetite, and food did not oppreſs his ſtomach. His tongue was covered with a cruſt of a browniſh white colour. His urine was more plentiful, and not of ſuch a deep colour, ſoon letting fall a lateritious ſediment. His pulſe was weaker and ſmaller, and free of intermiſſion in the forenoon, but; in the afternoon, was unequal in the ſtrength and fulneſs of the ſtroke.

I continued the former preſcriptions, and deſired he might take ſome *gummous cardiac pills*, with ſoap, and a *terebinthinat clyſter*, morning and evening, and cauſed all the pained parts to be covered with a plaiſter compoſed of the melilot and *diachylon cum gummi* plaiſters and *gum ammoniac* mixed.

From this day his urine ſettled well, and had a great quantity of a lateritious ſediment; and he always ſlept well, except when his pacific was omitted.

I ſaw him again on the thirteenth at night; his pulſe was then leſs frequent, equal, ſtronger, and more full, but intermitted at every thirtieth or fortieth ſtroke. His reſpiration was freer. The heat of his ſkin was moderate, and his ſenſe of internal heat much leſs. The weight at the right hypochondre was much diminiſhed. He felt no pain, and could lie more eaſily on his left ſide. His thirſt was leſs, and he ſat up while his bed was making.

He had had four looſe ſtools in this and the preceeding day.

Next morning, his pulſe was free of intermiſſion, ſtronger and leſs frequent; the reſpiration eaſy. He felt no internal heat nor weight, and lay eaſily on the left ſide. The yellow colour of his ſkin and eyes were conſiderably leſs.

This day and the following, his reſpiration ſometimes was difficult, and his pulſe had intermiſſions. He ſlept much, and had no ſtool till his clyſters were repeated.

The quieting draught having been omitted on the fifteenth at bed time, he was reſtleſs all night, and complained of heat.

When I ſaw him the following afternoon, his pulſe was quicker, larger, ſtronger, and equal; the heat of his ſkin moderate; but the complaints of internal heat were again renewed; his reſpiration was quick and difficult; his ſpirits were much oppreſſed, and he frequently ſighed. The cruſt of his tongue was moiſt, and of a light brown colour; his urine turbid, as from the fourteenth. He had a copious ſtool in the evening; after which I cauſed a bliſtering plaiſter to be applied to his neck and ſhoulders, and repeated his draught with the uſual effect.

In the morning after, he was more chearful and free of ſighs, his ſpirits lively, his pulſe leſs frequent, and breathing freer and ſlower; the ſenſe of internal heat much abated; the cruſt of his tongue was dry, and of a dark-brown-colour; the yellowneſs of his ſkin, &c. was leſs; his urine of a deep citron colour.

In the forenoon of the nineteenth day of his diſeaſe, he was perfectly eaſy: In the afternoon, he ſlept ſome hours; and about ſix he awaked, with an exquiſite pain in his belly, which was ſoon followed with a continual vomiting of a black moſt viſcid liquor, and with very difficult breathing. Theſe ſymptoms put an end to his life in a few hours.

When his body was opened next day, a conſiderable quantity of purulent matter was found in the cavity of the abdomen, which we judged to have come out of three abſceſſes we obſerved in the liver; the firſt was a large one, formed on the ſuperior convex part of the large lobe near the coronary ligament; the external coat of the liver, which had been raiſed here into a bag, was much thickened, very tender, and moſtly white, but in many places red, as if it had been injected. The ſecond abſceſs was near the inferior margin of the ſame lobe; and the third was near the gall-bladder. The external membrane of the liver was much inflamed in many parts of the convex ſide of this bowel; and the ſubſtance of the great lobe was very tender.

The gall-bladder was very tender, and contained eight calculous concretions, of different bigneſs and ſhapes; the largeſt was flat, and about the bigneſs of a Turky bean; the ſmalleſt was not ſo large as a grain of barley. They were of a black colour externally, but were of a browniſh-grey within; and ſome of them had a nucleus of a white ſubſtance. Theſe ſtones floated in a great quantity of a thick dark-brown or blackiſh humour, reſembling mum in colour and conſiſtence. The ſtomach alſo contained a great quantity of the ſame liquor, was much inflamed, with numbers of red points; and at its fundus and left orifice, the veſſels appeared as if they had been injected. No rugæ were obſervable on its internal ſurface. The colon was alſo inflamed.

XXX. *An extraordinary large Gall-Bladder and hydropic Cyſtis; by Mr* JOSEPH GIBSON, *Surgeon in* Leith, *Member of the Society of Surgeon Apothecaries of* Edinburgh, *and City Profeſſor of Midwifery.*

WILLIAM GORDON, of a healthy habit, when about twelve years of age, in October 1721, fell from a wall of three yards perpendicular height a-croſs an old tree, on which his right ſide ſtruck; and he immediately complained of an acute pain all over the baſtard ribs of that ſide; but, by repeated blood-letting, it decreaſed into an obtuſe heavy one, or rather a ſenſe of weight; which not being ſo conſiderable as to confine him at home, or to reſtrain him from play, was not taken further notice of by his relations, till after ſome months, when he was obſerved to grow lean, to eat little, and leſs fond of diverſions than uſual; which giving the alarm, he was adviſed to go to the country, and to be put on a diet of whey, with riding on horſeback: Both which (the ſeaſon favouring) he followed, and returned to town after harveſt in ſeeming good plight, without any other complaint than a little weight or wearineſs, as he expreſſed it, in both ſides, upon running, or any violent exerciſe; but had not been long at home, till I was conſulted about him. He then complained of the pain in his right ſide, had loſt his fleſh and colour, and was become exceeding ſlothful. A few weeks added a long train of other yet more direful ſymptoms; for he ſuffered a conſtant pain in his ſtomach; vomited often, drank much, had his tongue parched, his ſkin dry and hot, his pulſe was frequent and feeble, his urine crude, and in ſmall quantity; his belly very coſtive, and what excrements he voided were white; he breathed quick; his legs pitted towards the evening; and a hard circumſcribed ſwelling began to appear in his right ſide, and increaſing daily ſtretched itſelf over the *ſcrobiculus cordis*, to the left hypochondrium, raiſing the under part of the ſternum, and forcing outwards the falſe ribs of both ſides.

His legs, which only pitted towards the evening, during eight months after his fall, were, in November 1722, conſtantly ſwelled, as were his thighs and belly. About the middle of January following, water was felt fluctuating in his abdomen, and, till the beginning of April thereafter, all his ſymptoms increaſed dailie, eſpecially the difficulty of breathing, which did not allow him to ſit, far leſs to lie down; but, ſome days before his death, he was obliged to ſtand erect, ſupported by chairs, tables, or the people about him, while he ſlumbered.

This melancholy ſituation made him beg ſo earneſtly for relief in breathing by tapping, that I yielded to his importunity; though I had always aſſured his relations, there were no hopes of removing his diſeaſe by that operation, becauſe the dropſy was of the incyſted kind, and the water was incloſed in veſicles. Having applied a laced feneſtrated bandage, ſupported by a ſcapular, in order to prevent the faintings which commonly do enſue, and have often proved fatal, upon drawing off at once all the waters contained in the belly of hydropic people, without this or ſome ſuch precaution. I placed my patient in the moſt convenient poſture his caſe would admit; and, in preſence of Mr Edward Hawkins ſurgeon to my Lord Delorain's regiment, and of Mr Adam Lindſay chirurgeon-apothecary in Edinburgh, I drew off, by the trocar, near three Scots pints or twelve pounds of water, of a greeniſh hue, having a groſs ſediment of the ſame colour. The lower part of his belly ſubſided to very near its natural dimenſions after this evacuation; but its ſuperior part did not in the leaſt diminiſh. While the waters ran out, the bandage was proportionally ſtraitened, as his breathing would permit, and the wound was dreſſed as uſual. He died the ſecond day after the operation, being the 3d of April, and I was allowed to inſpect his body on the 5th.

I was aſſiſted in the diſſection by one of the gentlemen preſent at the operation, and by Dr James Crawfurd late profeſſor of Hebrew and medicine in the univerſity of Edinburgh, whoſe univerſal literature, and conſummate medical knowledge, joined to all thoſe amiable qualifications which made up the beautiful cha racter of a good man, and ſincere friend, muſt make all who had the happineſs to know him beſt, to bemoan with me their own private, and regrete the public loſs of him.

When the peritoneum was cut open, the contents of the abdomen had ſuch a different appearance from what they uſually bear, that we had the greateſt difficulty to diſtinguiſh the viſcera. The omentum, which was firſt in the way, was not at all fatty, but had its blood-veſſels very conſpicuous, and ſome other veſſels, that were exceeding ſmall and numerous, were obſerved on it, which we took to be the *ductus adipoſi Malpighii*. At the lower part, where the caul is ordinarily free, it adhered ſo very firmly to the inteſtines, that it could ſcarce be ſeparated without tearing.

The ſtomach was rather leſs than ordinary, and was preſſed by the gall-bladder and ſpleen, into an oblong form, not much unlike the cæcum.

The inteſtines and other viſcera of the abdomen (the liver, gall-bladder, and ſpleen excepted) appeared almoſt as uſual, only were more tender, ſcarce bearing the touch.

The liver was not much bigger than ordinary; but its convex part adhered ſo intimately to the diaphragm, as it was impoſſible to ſeparate them without the help of the knife. When this viſcus was cut, a great number of ſpherical tubercles, about the bigneſs of a common bean, appeared in its ſubſtance: Some of the gentlemen then preſent were inclined to eſteem theſe to be glands; but how juſtly, I am not to determine. It was obſerved that they had no veſſels either entering in or going out from them, and ſeemed only to be ſet looſe in the ſubſtance of the liver.

The gall-bladder was continuous to all the concave part of the liver, and was extended to a moſt ſurpriſing bulk; for it contained no leſs than two Scots pints, or eight pounds of bile, rather thicker than the cyſtic generally is, and of which ſeveral concentrical bags, incloſed one within another, were formed; theſe had all the internal figure of the gall-bladder, and differed from each other only in this, that thoſe which were next to the veſica were firmer and more opaque, while the more internal were of a lighter green colour, and of a more tender ſubſtance.

The *ductus communis cholidochus* was larger than uſual, and was filled with many ſmall ſpongy ſtones of a yellowiſh hue that ſwam in water.

The ſpleen was natural in its ſubſtance, but adhered to the diaphragm as the liver did; and it had an additional coat from that part of the peritonæum which covers the diaphragm. This and the common external coat formed a preternatural cyſtis that contained three Scots chopins, or ſix pounds of a clear ſerum, without ſmell, but exceeding ſalt, and not coagulable.

The liver and ſpleen were continuous, by a ſmall lobe that went from the lower edge of the liver under the ſtomach, and terminated membranous into the cyſtis of the ſpleen.

This extraordinary gall-bladder, and preternatural cyſtis annexed to the ſpleen, are ſtill in my poſſeſſion, ready to be ſhown to any of

you

you who will take the trouble to examine them.

I ſhall not tranſgreſs your rules, by ſubjoining any theorical account of this boy's ſymptoms; but beg leave to be allowed to apply this hiſtory to that excellent eſſay of an anonymous author on the jaundice, which is the XXXIII. Article of your firſt volume.

Though at firſt view of the caſe I have related, it ſeems to condradict what is argued for in that article, by the boy having no icteric ſymptom, notwithſtanding the cyſtic bile was prevented from paſſing down into the inteſtines, by ſtones lodged in the *ductus cholidochus*, and the gall-bladder was ſo full of it; yet when we conſider how very viſcid this boy's cyſtic bile was, that it was formed into concentrical bags, and therefore could not regurgitate, or be reaſſumed into the blood-veſſels, which the author of the eſſay always ſuppoſes neceſſary for occaſioning the jaundice, this hiſtory will rather appear favourable to his opinion.

XXXI. *An uncommon Suppreſſion of Urine, with a preternatural Size of the Kidney; by Mr* GEORGE BALDERSTON *Chirurgeon-Apothecary in* Edinburgh.

A Woman about thirty five years of age, frequently complained of nephritic pains for two years, and often paſſed ſand with her urine. In Auguſt, laſt ſhe was carried home from the harveſt-field, having been laid aſide from work, by a violent pain of the right kidney;

ſhe was ſoon relieved by a clyſter, and paſſed a few ſmall ſtones. Ten days after, ſhe was taken ill again in the ſame manner, when, in one morning, ſhe paſſed twenty-five ſmall ſtones, and three or four at a time, of the ſame ſize, for ſeveral days afterwards. Through the winter, ſhe conſtantly vomited ſolid food immediately, but kept liquids for moſt part till bed-time. Her pains frequently returned; but no ſtone appeared till about three weeks before her death, that ſhe paſſed three or four more in a morning, and was ſoon after ſeized with a ſuppreſſion of urine, which continued almoſt total for fifteen days; having in that time not voided above a gill of water, and that only by drops deeply tinged with blood, and attended with the utmoſt pain and uneaſineſs: Her belly at the ſame time was much diſtended, and pained, eſpecially about the navel and *regio pubis*.

In this condition I found her at my firſt viſit on the 16th of May 1733. I immediately ſounded her, and imagined I found a ſtone, which eaſily yielded to the catheter; ſhe felt immediate eaſe, though ſhe voided but a few drops of urine, and, on withdrawing the catheter, I perceived a conſiderable reſiſtance, as if one had been pulling againſt me. In the afternoon, ſhe was ſeized with a violent pain in the right kidney, and the ureter of the ſame ſide. I ordered her a turpentine clyſter, and a pacific mixture to be taken as ſoon as it was paſſed: About ten that evening, ſhe voided half a mutchkin of urine, and was much eaſed both of the pains, and diſtenſion, and ſwelling of her belly.

Next day, ſhe was free of pain, but very ſick, and vomited whatever ſhe took. I cauſed her to drink plentifully of a decoction of althea root, moſt of which ſhe threw up: In the evening ſhe got a turpentine clyſter, and was ordered to take the pacific mixture after it was paſſed, but ſhe kept the clyſter all night.

The day following, finding the clyſter ſtill remained in her body, I ordered her a pound of a ptiſan of *ſenna*, *tamarinds*, and *aperient roots*, of which ſhe drank a gill every hour while it laſted. She vomited moſt of the ptiſan, which, however, about ten at night, procured her two ſtools. She got the paregoric immediately after, and had an eaſy night.

She paſſed the 19th day pretty eaſily, without taking any medicine.

On the 20th, the ptiſan was renewed, with the addition of rhubarb; but ſhe threw it up ſo quickly, that it had little effect on her belly: The vomiting increaſed towards evening, when I gave her a ſtomachic opiate mixture, with *ſal abſinth.* and *ſyrup limon.* to be taken in ſpoonfuls, and ſometimes a glaſs of Rheniſh wine. The pain ſhe formerly complained of at her navel and *regio pubis* now removed to the ſtomach, and ſeized chiefly its upper oriſice.

On the 21ſt before noon, the vomiting ceaſed, and returned no more; ſhe continued the mixture and Rheniſh wine, and took a little bread-berry; but her breathing became laborious, and wheezing, though her pulſe continued calm and ſtrong, as it had been all along. About four afternoon, ſhe was ſeized with convulſions ſo ſtrong, that four women could ſcarce keep her in bed: Soon after, her pulſe became weak and irregular. About two in the morning, ſhe had a ſecond convulſion, which brought blood from her mouth: After which ſhe lay calm, but ſunk gradually till ten before noon that ſhe died.

During the whole courſe of her diſeaſe, ſhe never could lie on the left ſide, but was all along free of pain both of her left kidney and ureter.

Upon opening the body before Dr Andrew Sinclair, profeſſor of medicine, and Dr Moncrief, we found the muſcles of the abdomen extremely thin, a conſiderable quantity of water betwixt them and the peritoneum, and likewiſe ſome water in the cavity of the belly.

The ſtomach was ſound; moſt of the ſmall guts ſlightly inflamed.

The liver very large, but not hard; the whole convex ſurface of the right lobe ſtrongly attached to the peritonæum, the extremity of its left lobe contiguous to the ſpleen.

The ſpleen conſiderably larger, thicker, and ſofter than uſual.

The uterus inflamed, with both its cornua obſtructed, by a tough white matter of an unequal conſiſtence.

The ovaria much contracted, flat and white, without any ova.

That part of the peritoneum which covered the right kidney, of a very unnatural thickneſs.

The right kidney of a monſtrous large ſize; the blood-veſſels on its ſurface very red and turgid. Upon making an inciſion into its external convex ſide, a ſmall quantity of pus was found near the pelvis; in the pelvis itſelf was contained a large ſtone, and a great number of ſmaller ones of different ſhapes and ſizes; none of them exceeding the bulk of a common pea, and none leſs than a great pin's head.

The ureter on the right ſide little above the natural ſize.

The left kidney ſo ſmall, that with difficulty it was found; neither ſtone nor ſand in any of three ſmall cavities which it had inſtead of a pelvis.

The left ureter very large near the kidney, then much contracted, and afterwards dilated again above the natural dimenſion, See fig. 3. which exhibits the dimenſions both of kidney and veſſels.

There was nothing found in the bladder.

Explication of Fig. 3. *TAB.* IV.

A The kindey as large as the life.

B One of the cavities that ſupplied the want of a pelvis opened by part of the ſubſtance of the kidney being cut off.

N. B. The three cavities had no communication with each other within the kidney; and, though there were ſome ſmall urinary canals opened into each, I could not obſerve any papillæ.

C The Trunk of the emulgent artery.

D The emulgent vein.

E The nephritic nerve, the branches of all theſe veſſels going to the kidney are delineated, but need no explication.

F The canals coming out from the three cavities, to compoſe one large ſac G, at the beginning of the ureter.

H The ureter preternaturally ſtraitened.

I The ureter again dilated to the ordinary ſize.

XXXII. *A ſuppreſſion of Urine; by Dr* FRANCIS PRINGLE, *late Preſident of the College of Phyſicians in* Edinburgh.

A Gentleman about ſeventy three years of age, of a healthy conſtitution, and full habit of body, was ſeized on Tueſday June 22. with a total ſuppreſſion of urine, attended with pains about the *os pubis*, region of the loins, and kidneys, and with frequent vomitings of a darkiſh-coloured ſubſtance, reſembling coffee or chacolate; he had alſo frequent returns of the hiccough, and complained of a ſcalding heat, when he ſwallowed any drink, eſpecially if it had the leaſt acrimony.

He continued two days in this ſtate, notwithſtanding his having been let blood by his ſurgeon, who alſo gave him ſeveral clyſters, and a decoction of the aperient roots, with *ſal prunell.* for drink.

Being called to him on Thurſday June 24th, I immediately ordered him to be ſounded, and three mutchkins and a half of a dark-coloured moſſy urine were voided by the catheter. After which the black vomitings and hiccough ceaſed; and he found ſo much relief every way, that he delayed the uſe of the ſemicupium, which I had cauſed to be prepared for him; but he had emollient terebinthinate clyſters injected; and he continued the uſe of the aperient diuretic decoction, to the materials of which ſome althea roots were added.

Next day, having paſſed no urine, he was put into a ſemicupium; and, that availing nothing, he was again ſounded, and paſſed ſome leſs quantity of urine than was taken away before. While the ſurgeon ſounded him, the catheter met with little reſiſtance; neither was there any appearance of ſtone, ulcer, or caruncle in the neck of the bladder; nothing came away with the urine, except a drop or two of coagulated blood, and ſome ſandy gritty ſediment.

He continued in this condition, till the Saturday evening, when he was obliged to be ſounded again; and, his pulſe being frequent, hard and ſtrong, with heat and thirſt, he was blooded. On Sabbath, he was ſounded for the fourth time, was again put into the ſemicupium, and a laxative purging ptiſan given, which anſwered well enough.

From the firſt time he had been ſounded, the black vomitings left him; but he was troubled with the hiccough from time to time, which increaſed ſo much on Tueſday June 29th, being accompanied with a low depreſſed pulſe, and coldneſs of the extremities, that it was judged proper to apply a bliſtering plaiſter between his ſhoulders at night; and, beſides the former medicines, he was ordered to take frequently a ſpoonfull of the ſolution of *balſam copaib.* to which ſome gutts of the *ol. macis chemic.* diſſolved in ſugar, were added. He ſlept well all night, and was quite free of the hiccough, and had a good pulſe next morning; but paſſed no urine till the catheter was again introduced. Upon removing the bliſtering plaiſter, he felt ſome ſharp pains, reſembling thoſe of a ſtrangury, which were probably owing to the bliſter: He was therefore ordered to drink plentifully of the *emulſio arabica*, and, at bed-time, to take a bolus compoſed of *pulv. rad. valerian. ſilv. gr.* x. *Caſtor. Ruſſ. Sal. ſuccin. camphor. a gr. v. Extract. opii. gr.* I. *Syrup. cariophyll. ſ. q.* which eaſed his pains, and procured him a pretty good night. At the ſame time he continued to take the ſolution of *balſ. copaib.*

On the three following days he continued much in the ſame way, being ſounded every day to evacuate the urine, which he never paſſed without the catheter. July 3d, he was ordered to drink plentifully of Piermont water and Rheniſh wine, and *pareyra brava* was added to his ordinary diuretic decoction.

July 4th and 5th, there was ſcarce any change; his decoction, Piermont water, and Rheniſh wine were ſtill continued. On the 6th, 7th, 8th, being a little ſtronger, he rode ſometimes out in a chaiſe, and continued in the uſe of the ſame medicines, only half a drachm of the oil of juniper, and as much ætherial oil of turpentine were added to ſix ounces of the copaiba mixture. On the 9th or 10th, he had a gradual ſlow diſcharge of more than a pound of urine, without the aſſiſtance of the catheter, which the ſuppreſſion he had of urine put us under the neceſſity of introducing every day from the beginning of his diſeaſe, till the 17th or 18th of July, when he came to void his water in the natural way and regularly. He continued the Rheniſh wine, and ſpaw-water, with riding on horſeback, or in a chaiſe, for ſome time, making rather more urine than he was formerly in uſe to do, and continued a conſiderable time in good health, without having any occaſion to be ſounded.

Afterwards this gentleman was ſubject to frequent returns of the ſuppreſſion of urine upon any exceſs in his bottle; and five years after, was attacked with the ſame ſymptoms as formerly; but, neglecting to call proper aſſiſtance in due time, the diſeaſe was ſo advanced, that it was very difficult to ſound him. In a few days a conſiderable quantity of bloody matter was brought away with the catheter, the fever and other bad ſymptoms increaſed, and he died.

XXXIII. *An Account of Medical Diſcoveries, Improvements, and Books publiſhed in the Year 1731, and omitted in the firſt Volume of this Collection.*

Diſcoveries and Improvements.

DR Stahl, firſt phyſician to the King of Pruſſia, recommends the eryſimum or *verbena foemina* as a good medicine for ſchirrho-cancrous tumors, both when taken internally, and applied to the tumor. Mr Bingert, ſurgeon at Berlin, communicates two hiſtories of its good effects in ſuch caſes, *Act. Med. Berolin.* Dec. 3. vol. 1. p. 59.

Morgani confirms by ſeveral experiments what Burlet had affirmed of *aq. calc.* not coagulating milk, *De Bonon. Art. et Scient. Inſtitut. atque Acad. Comment.* p. 155.

The powder of the *fungus thyphoides coccineus Melitenſis* is recommended as a good and ſafe ſtyptic in hæmorrhagies, ibid. p. 153.

Mr Le Dran mentions ſeveral examples of his ſucceſs in curing white ſwellings of the joints, or tumors occaſioned by a collection of inſpiſſated lymph, by a ſmall ſtream of warm water falling from a height upon them. When the water is impregnated with penetrating medicines, or natural minerals, its virtues are greater. Beſides the uſe of theſe *douches*, as he calls them, he alſo recommends the application of bladders, containing warm water, to the parts affected with ſuch diſeaſes, *Le Dran Obſervations chirurgicales, tom.* 2. *Obſerv.* 93. 94.

M. Bailleron ſurgeon, affirms, that a compoſition of ſulphur, roſin, and honey, proves an eſcharotic medicine, but gives little or no pain, *ibid. obſerv.* 100.

Morgagni has never yet fulfilled his promiſe of publiſhing Valſalva's poſthumous works, which he propoſes to comment on, and add notes to: But, by a ſhort abſtract from his papers now publiſhed, we may judge what diſcoveries Valſalva is to treat of.

His firſt diſſertation is to be on the ligaments of the colon, which other authors, and particularly Morgagni, has prevented him in.

Next he treats of the ſinuſes of the aorta. By ſinus he means any part of an artery, where its ſides are ſtretched outwards beyond the ordinary proportional dimenſions elſewhere. He obſerves four ſuch ſinuſes; three of them anſwer to the ſemilunar valves; and the fourth is all that part of the aorta between the former ſinuſes and the origin of the common trunk of the right ſubclavian and carotid arteries.

He then gives ſome reaſons why the *nervus acceſſorius*, aſcribed commonly to Willis, ſhould not be ſaid to have its origin where the common deſcriptions place it, but ſhould, on the contrary, be thought to riſe from the eighth pair, to be joined to the *medulla ſpinalis*.

Valſalva calls that ring, which the muſcles of the eye make round the optic nerve at the bottom of the orbit, by the name of the *moderator ring* of that nerve, alledging that the exterior fibres of theſe muſcles, which riſe from the nerve, muſt ſhorten it when they contract; and, when the interior fibres act, they muſt compreſs it; ſo that theſe different fibres of the muſcles affect the nervous fluid here very differently. Thereafter, he accounts for ſeveral phænomena of viſion, from this ſtructure. He alſo deſcribes ſuch another ring made round the motory nerves of the eye; but acknowledges that it is neither ſo remarkable or diſtinct as the former.

The laſt treatiſe mentioned by Morgagni is the one wherein Valſalva endeavours to prove the *renes ſuccenturiati*, or *glandulæ renales*, to be organs of generation, or aſſiſtant to them. Valſalva had endeavoured to ſecure the honour of this diſcovery to himſelf, by entering a public proteſt, that no other ſhould claim it. Mr Ranby, ſurgeon to the King of Britain's houſhold, ſuſpected that the duct, which the Italian literary journals mentioned as the principal part of this diſcovery, was no other than an artery ſent off from that of the capſula on each ſide, to the teſticles of men, and ovaria of women. (See Phil. Tranſ. Numb. 387. § 3. and Numb. 395. § 12.) † Morgagni has now explained Valſalva's doctrine more fully.

Valſalva gives the following reaſons for his opinion of the *renes ſuccenturiati* being aſſiſtant in generation, by means of their excretory ducts. He obſerves the ſeminary veſſels

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† We beg Mr Ranby would determine whether the artery he deſcribes is conſtantly or ſeldom found.

ſels of ſeveral fowls to come out from theſe capſulæ, before they are ſent from the teſticles. In the viper and water tortoiſe, he remarks ſuch membranous connexions between the *renes ſuccenturiati* and teſticles, as make it probable that ſuch excretories are ſent through the capſulæ to the teſticles. He affirms his having ſeen veſſels that were neither nervous, ſanguiferous, nor lymphatic, going from the human capſulæ to the teſtes. His obſervations are much the ſame as to females. To theſe he ſubjoins the conſent and ſympathy obſerved by phyſicians between the loins, and the natural or genital parts. To confirm all, he relates the following experiment: He cut away one teſticle, and extirpated the kidney of the oppoſite ſide of a whelp. The wounds healed, but the creature was of a very lax habit, and was ſo far from attempting coition with bitches, that he did not ſeem fond of them when they were proud, *Acad. Bononienſ. Comment.* p. 376. &c.

Petrus Nannius, after giving ſome examples of veſicular bodies found in the conglomerate glands, which, he thinks, ſupport the malpighian ſcheme of glands, endeavours to prove the neceſſity of ſuch veſicles for receiving all the different particles required in the compoſition of ſecerned liquors, that muſt be conveyed in different ſeries of veſſels, to be intimately blended in the veſicle, which will be conſiderably aſſiſted by the ſyſtole and diaſtole, which he ſuppoſes the veſicles to undergo, ibid. p. 326. &c.

Dominic. Guſman. Galeatius, having found ſmall black biliary concretions contained in folliculi of the coats of the gall-bladder, concludes Malpighius's opinion of the glands of the gall-bladder to be thereby confirmed, ibid. p. 355.

Mr Lamorier propoſes ſome improvement on the operation of the *fiſtula lacrymalis*; for he deſires the *os unguis* to be laid bare at the firſt inciſion, and immediately after to pierce it with a pair of ſtrong ſharp-pointed crooked forceps, then, to dilate the perforation, by opening the forceps. After the inflammation is over, he would have a piece of ſmall wax-candle ſhaped like a tent, introduced by the wound into the noſe, where he ſecures it by the other dreſſings. He continues the uſe of this bougie till the paſſage is made callous and out of hazard of reuniting, after which he allows the external wound to cure. The advantages he propoſes by this method, are to abridge the operation, and to ſecure a paſſage for the tears into the noſe. *Memoire envoye du Montpelier a l'Acad. des Sciences* 1729.

Mr Le Dran, ſurgeon at Paris, has mentioned ſeveral improvements in ſurgery, in his two volumes of obſervations.

He cured a polypus of the noſe that he could not extract wholly, in the following manner, which may be practiſed for deſtroying all ſuch excreſcences. He introduced one extremity of a large ſeton, put on the point of the fore-finger of the left hand, into the patient's mouth, till he brought it behind the *velum pendulum* of the palate, then ſliding a pair of thin crooked forceps, held in the right hand, into the affected noſtril, he catched hold of the end of the ſeton, and brought it out at the noſtril, leaving its other extremity hanging out at the mouth. Every day he ſhifted the part of the ſeton in the noſtril, after covering what was to be introduced into the noſe with a ſuppurant medicine. While he drew the cord, he endeavoured to preſerve the poſterior edge of the *velum pendulum* from being hurt, by introducing his finger into the mouth, and ſupporting the cord upon it. He continued the uſe of the ſuppurant, till he was ſenſible, by the patient's breathing freely through the noſtril, that the remains of the polypus were deſtroyed, and then he injected deſiccatives to cicatrize the ulcer, *tom.* 1. *obſerv.* 6.

In his reflexions on this ſixth obſervation, he propoſes to make ſuch a ſeton ſerve for ſtopping hæmorrhagies of the noſe; for which purpoſe he faſtens two doſſils to the cord, and, after drawing one out at the noſtril, to bring away the clotted blood, he continues to draw the cord, and ſo fills up the poſterior part of the noſtril with the other, which ought to be larger, and well wet in a ſtyptic liquor, by which not only the hæmorrhage may be ſtopped, but, if it ſhould continue, the doſſil will effectually prevent the blood and medicines put into the noſe, from running down the throat, which commonly occaſion a cough or vomiting that increaſes the bleeding. He confirms his reaſoning by the ſubſequent obſervations, which is an example of the ſucceſs of this method.

In his obſervations on wounds of the

head, viz. from obſerv. 15. to 29. he endeavours to ſhew how much more dangerous the caſe is, when the cranium does not break by violent blows, &c. than when it is fractured, becauſe of the greater commotion of the brain, contuſion of the ſkull, and ſeparation of the *dura mater* in the former caſe; and therefore concludes it neceſſary to perform the operation of the trepan oftner than is commonly practiſed.

In his reflexions on the 31. obſerv. he remarks, That, whenever any conſiderable quantity of pus is contained in either cavity of the thorax, that ſide will appear larger than the other.

Tom. 2. *Obſerv.* 59. He deſcribes a *biſtoury cache* of his own contrivance, for more ſafely performing the operation for herniæ. The point of the biſtoury does not come out of the furrow of the directory, but ſlides in it, while the edge of the blade is raiſed, and there is a wing or broad plate that ſtands out on each ſide of the directory, to keep down the guts, and thereby to prevent the hazard of their being cut.

Obſerv. 80. He aſſures us, that, when a ſmall ſtone is lodged in the neck of the bladder, the patient only is pained in piſſing, till the firſt drops of the urine come away. When the ſtone in the bladder is large, his greateſt pain is while the laſt drops are evacuated; but when the difficulty in urining depends on the diſeaſes of the coats of the bladder, the pain continues all the time of the evacuation. By obſerving theſe ſymptoms, he has determined people to have no ſtone in their bladder, after ſeveral others had aſſured them there was a ſtone; and his opinion was confirmed by probing with the catheter. He names one particular inſtance of this in a perſon who laboured under what he calls a contracted hardened bladder (*veſſie retrecie & racornie*) whom he cured after ſeveral bleedings, and purgatives, by injecting into the bladder the mucilaginous decoction of *rad. alth. & ſem. lini*, which he changed afterwards for barley water, with ſome melroſe; for by theſe he removed the pain and brought the bladder, which could ſcarce contain at firſt two ſpoonfuls of liquor, to the ordinary capacity.

Obſerv. 112. He deſcribes the amputation of the metatarſal bone of the great toe. He cut with a biſtoury between the affected metatarſal bone and the one next to it, till his knife paſſed beyond the carious part, and even beyond the ſwelling of the tegument; then introducing a furrowed probe between the bones near the poſterior extremity of the inciſion, he puſhed his biſtoury by the help of it ſome way between the bones, and made a ſemicircular inciſion upon the metatarſal bone of the great toe, firſt above and then below, ſo as to make a compleat circular wound, and to lay that bone bare all round; and immediately taking out the furrowed probe, he introduced a thin plate of lead in its place, and with a fine ſaw cut the affected bone through, the next one being ſaved from any injury by the plate of lead.

Morgagni tells, that Valſalva ſhews by ſeveral reaſons and examples, the cataract to be a diſeaſe of the chryſtaline humour and not a membrane.

The principal difference, according to him, between a cataract and glaucoma, is, that, in the latter diſeaſe the chryſtalline humour becomes hard, and of a ſky-colour (*glauci coloris*); and in the former it is ſoft, *Comment. Acad. Bonon.* p. 378.

Dr Albertinus's remarks on ſome faults of reſpiration, depending on the leſed ſtructure of the heart and præcordia, will not admit of ſuch an abridgment as our deſign allows; wherefore we muſt refer to the original treatiſe, ibid. p. 382.

The ſame gentleman obſerves, that all feveriſh diſeaſes, nay almoſt all diſeaſes, are followed by criſes; and that, particularly after intermitting fevers are ſtopped by the Peruvian bark, critical evacuations are to be expected; if they do not come timely, the patient is in danger of ſome other diſeaſe, eſpecially if any uſual or habitual evacuation has been hindered. In which caſe it is dangerous to give the bark, unleſs we are on our guard to promote a ſuitable excretion, if a criſis does not ſoon come naturally, ibid. p. 405.

Cajetanus Tacconus, M. D. tried many experiments with the mucilage of the joints of brutes, and of men both ſound and gouty, in order to diſcover whether the gouty matter is acid or alcali; and concludes, that the matter of this diſeaſe is ſometimes of the one and ſometimes of the other nature. The ſigns by which he thinks they may be diſtinguiſhed are theſe:

If the gout produces no tophi or knots, or does it very ſlowly; and eſpecially if it is attended with oedematous ſwellings, he pronounces it to depend on an alcaline humour: But, if the knots are large, and quickly formed, he is of opinion it is owing to an acid. The method of cure muſt conſequently be very different according to the cauſe, ibid. p. 148.

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Racolta degli opuſcoli ſcientifichi e filologici, *Tom.* 4. Venet.

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Reflexions critiques ſur l'emmenologie de Mr Freind, *par* Mr Tellier *le fils*, *Medicin*, 12*mo*, a Paris.

Juſti Veſti, M. D. *in Academia Erfurtenſi*

P. Inſtitutiones medicæ reformatæ nunc denuo publici juris factæ, 8vo, Francofurt. & Lipſiæ.

Il medico in Mantoua, oppure qual metodo di medicare nelle palluſtri, e quale nelle cita montane convenga di Flaminio Corghi, M. D. Mantoue.

Dilucidazioni Fiſico-mediche del Doitor Sancaſſini *tendenti a richiamare la medicina practica alla preſioſa Purita, in cui ce la laſcio il grande Ipocrate; con altri prattati concernenti a tale importantiſſimo argumenti, fol.* Roma.

XXXIV. *An Account of the moſt remarkable* Improvements *and* Diſcoveries *in Phyſic made or propoſed ſince the Beginning of the Year* 1732.

THE ſmall pox are generally believed to have been firſt obſerved and deſcribed by the Arabians; but Dr Hahn endeavours to prove in his book intitled, *Variolarum Antiquitates, e Græcis erutæ,* that the ſmall pox was deſcribed by the old Greek phyſicians under the name of carbuncle.

In the epiſtle to Fabricius, tacked to his *Variolarum Antiquitates,* the ſame author uſes many arguments to ſhew Janus Damaſcenus and Meſue the Syrian to be the ſame perſon.

The Peruvian bark, ſo well known as a ſpecific in the ague, is now diſcovered to be as effectual in the cure of mortifications from an internal cauſe. The hiſtory of this diſcovery is: In 1715, Mr Ruſhworth ſurgeon in Northampton gave it to a patient labouring under a mortification; and, having afterwards other proofs of its good effects in this diſeaſe, communicated his diſcovery in 1731 to the maſter and governor of Surgeons Hall at London. Serjeant Amyand ſoon tried it in ſuch caſes, and found it ſucceſsful in ſeven. Mr John Douglas confirms it by the hiſtory of a patient of his, which he publiſhed in 1732; and Mr Shipton ſurgeon ſoon after relates his ſucceſs by this medicine to the Royal Society in London. Mr Ruſhworth and Mr Amyand confine its uſe to mortifications from an internal cauſe, and the former gentleman thinks it is not proper in all caſes of that kind, particularly where there is no intermiſſion of the fever, when only he adviſes it to be given. Mr Douglas ſeems to think it will ſucceed in all mortifications. All theſe three gentlemen gave half a drachm for a doſe every fourth hour. Mr Shipton increaſed the doſe to two ſcruples, and gave it while the fever continued. He propoſes to have it tried in *nomæ*, *phagedænæ herpes*, or other chironian ulcers. See Mr Ruſhworth's letter, Mr Douglas's account of mortifications, and Philoſph. Tranſact. Numb. 426. § 5.

Jo. Ge. Henr. Kramerus aſſures us we may depend on the ſame effect, in the cure of a dyſentery, from the decoction of common millet ſeed, called St Ambroſe's ſyrup, as is promiſed on the ſimarouba by Mr Juſſieu, *Commerc. literar. Noremberg.* 1733, *Hebd.* vi. § 3.

Dr Dovar, in his Phyſician's Legacy to his country, having recommended quick-ſilver as a moſt beneficial medicine for ſeveral diſeaſes, morning draughts of crude quick-ſilver became the top of the mode laſt winter in London,

don ; which has occaſioned the writing of a great many pamphlets, ſome condemning, others extolling this practice : But, till the contending parties are better agreed about their facts, caſes, and hiſtories, nothing poſitive can be determined.

Mr Boulduc deſcribes a manner of making *corroſive ſublimate* more eaſily and ſafely, than can be done in the common way. He pours equal quantities of quick-ſilver and dephlegmated oil of vitriol into a retort ; then, with the help of fire, diſſolves the mercury, and draws off the phlegm, and part of the acid that does not incorporate with the quick-ſilver : The fire is continued till the white maſs of diſſolved mercury is dry, when he ſpeedily mixes it with equal parts of the whiteſt common ſea ſalt, dried by a gentle heat, and not decrepitated. And putting all into a matraſs, makes the ſublimation in the common way. After it is all raiſed, he breaks his matraſs, by taking it out of the ſand-heat while it is warm, or by putting a wet cloth on it, which prevents any of the ſublimate from falling down, as it does when the glaſs is broke by ſtriking on it. *Memoirs de l'Acad. des ſciences*, 1730.

Mr Le Fevre propoſes a compendious eaſy way of making colcothar of vitriol. He mixes two parts of filings of iron with one of common ſulphur and a little water ; after the acid of the ſulphur has diſſolved the iron, he expoſes the paſte to the air, and it changes into colcothar. *Hiſt. de l'Acad. des ſciences*, 1730.

Mr Petit the phyſician's obſervations and experiments on the colour, conſiſtence, meaſure, weight, &c. of the cryſtaline humour of the eye and its capſula in different animals, are ſo minute and numerous, that it is impoſſible for us to make ſuch an abridgment of them as our deſign will allow; we ſhall only obſerve, that he ſhews the cryſtalline to conſiſt of concentrical laminæ: He always found the capſula tranſparent, and denies any connexion between the membrane and the chryſtalline, or that there are many veſſels going from the one to the other; but that the cryſtalline is nouriſhed by abſorbing the lymph that is lodged between it and its capſula. *Memoires de l'Acad. des ſciences*, 1730.

Mr Winſlow's remarks on the motions of the head, neck, and ſpine, and Mr Hunauld's obſervations on the bones of the human ſkull, are ſo particular, that we muſt refer our readers wholly to the originals in the *Memoirs de l'Acad.* 1730.

Dr Waltherus Profeſſor at Leipſic has given a very minute deſcription of the muſcles and ligaments in the ſole of the foot, which we cannot abridge; and therefore muſt refer to the *Nov. Act. Erudit. Lipſ.* April, 1732.

Dr Alexander Steuart Phyſician to the Queen of England, having cut off the head of a frog, obſerved, that, upon thruſting a blunt probe into the *medulla ſpinalis*, the muſcles of the body were brought into convulſive contractions; and that, the ſame happened to the muſcles of the head, when the probe was thruſt into the brain. From which he concludes, the brain and nerves to contribute to muſcular motion, and that to a very high degree.

gree. Next, he laid bare the crural artery, vein, and nerve of a dog; and, placing a thread parallel to them, he made two ligatures on them, at four inches diſtance from each other; then cutting the veſſels through beyond the ligatures, he took them out, and obſerved that the nerve did not contract, though the blood-veſſels loſt three eighth parts of their length: From whence he infers, that what the nerves contribute in muſcular motion, cannot ariſe from, or be owing to elaſticity, but to the fluid they contain; which he thinks the name of ſpirits unhappily contrived to expreſs, becauſe it is apt to miſlead into an idea of fermented or ſaline ſpirits; whereas, ſays he, we have no reaſon, from any appearances we can obſerve, either in the brain or nerves, to judge theſe ſpirits to be any other than a pure and perfectly defecated elementary water. *Philoſoph. Tranſ. Numb.* 424. § 5.

An anonymous phyſician, after mentioning the arguments uſed for and againſt the nerves being compoſed of cylindrical canals containing a fluid, offers what he calls an *experimentum crucis* in proof of ſuch a ſtructure; it is the demonſtration of the optic nerve inflated and dried, which appears cannular to the naked eye. *Preſent ſtate of the republic of letters, Vol.* XII. *Art.* 16.

Mr Browne Langriſh, in his eſſay on muſcular motion, endeavours, (p. 14.) to prove the blood to have no immediate effect in muſcular motion; which he does, by experiments of tying the crural and carotid arteries of dogs,

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who did not thereby loſe the action of any muſcles. He grants however, (p. 16.), that, when all the blood is intercepted, muſcular motion ceaſes in a few minutes. The chief uſe of the blood towards muſcular motion is, in his opinion, (p. 19.), to keep the fibres warm, ſupple, diſtended and every way ready for the influx of animal ſpirits into them; and, by its expanſive and progreſſive motion, to aſſiſt the motion of the animal ſpirits.

P. 23. He thinks the muſcular fibres to be little hollow cylinders, and could never obſerve that they were divided into cells, veſicles or bladders.

After explaining at large his opinion concerning the doctrine of attraction and repulſion, and obſerving the elaſticity with which our muſcular fibres are endued, and how volatile ſpirituous things, aſtringents, and cold bodies, incite the muſcles to a contractile motion, and increaſe their contraction; he ſuppoſes (p. 55.) the animal ſpirits to be near akin, or analogous to ſpirits of ſal ammoniac, hartſhorn, or human ſkulls; and therefore, whenever they fly from the nerves into the muſcular fibres, they will increaſe the attractive quality of their component particles towards each other, ſo as to make them run nearer together, which will conſequently occaſion the coats of the fibres to be both thicker and ſhorter, and the muſcle will be contracted, having all its dimenſions rather dimiſhed than increaſed. (p. 78.) The animal ſpirits, ſays he, are ſo ſubtile, that they cannot be fixed, and conſequently they will immediately make their eſcape through the muſcular fibres, and leave them in the ſame ſtate they found them in, as ſoon as the ſupply by the nerves is by any means diſcontinued.

According to our author, (p. 78.), there is a difference in the mechaniſm of the nerves, which are ſent to the muſcles that act by the influence of the mind, from thoſe of the muſcles that are ſaid to perform involuntary motions, the latter having no let or hinderance to the courſe of the animal ſpirits, unleſs ſometimes the parts through which they paſs have influence on them; whereas the nerves which ſerve the muſcles of voluntary motion have ſome little conſtrictions at their extremities, or elſewhere, which hinders the courſe of their fluids, except when their reſiſtance is overcome by the momentum of the animal ſpirits being increaſed by the will.

He thinks (p. 70.) the uſe of the ganglions is to prevent any communication of motion from one nerve to another, whereby, in a ſtate of health, ſenſation is always performed diſtinctly.

Mr Mery † attempted to eſtabliſh the doctrine of air being mixed with the blood in the pulmonary vein; and being again diſcharged into the branches of the trachea, by the ſmall branches of the pulmonary artery. His principal argument in ſupport of this doctrine was, That air blown into the trachea paſſed by the pulmonary veins into the heart,

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† Memoirs de l'Acad. des ſciences pour l'annee 1700 & 1707.

and that, by blowing air into the pulmonary artery, it could be forced into the trachea. Mr Bulſinger at Peterſburg undertook the examination of theſe facts, by a variety of experiments made with the air-pump, by which he obſerved, that water thrown in at the trachea, ran out at both the pulmonary artery and vein, and chiefly by the vein, which neither milk nor air would do. Water, injected into the pulmonary artery, paſſed into the trachea and pulmonary vein, which air alſo did. Water, injected into the pulmonary vein, was puſhed with difficulty, but at laſt ran into the trachea, and not into the pulmonary artery. Finding, therefore, that he could not force air in any trial from the trachea into the pulmonary blood-veſſels, he concludes Mr Mery's experiment, and conſequently his ſyſtem, to be falſe; but makes an apology for him, by ſhewing how readily his ſeeing the air, which had been lodged in the blood-veſſels before the blowing into the trachea, or what enters in the time of it, at the cut veſſels, might have led him into the miſtake, as it had done at firſt to ſome gentlemen who ſaw Mr Bulſinger's experiments, till he undeceived them. *Comment. Acad. Scient. Imperial. Petropol. Tom.* III. p. 230.

Mr Hales, in his firſt volume of Statical Eſſays, had given us by the way ſome experiments relative to the force wherewith the blood is propelled from the heart into the arteries; and now in his ſecond volume or hœmaſtatics, he has treated this matter more fully, giving us all the remarkable circumſtances of the many hydraulico-ſtatical experiments he has made with great pains.

P. 31. He obſerves, "That the force of "the blood in the veins and arteries is very "different not only in animals of different "ſpecies, but alſo in animals of the ſame "kind; and even in the ſame animal accord"ing to its different circumſtances. From "whence he concludes it requiſite to be fur"niſhed with a good quantity of obſervations, "thereby to find out the more nearly a medi"um of thoſe forces, not only in the ſame "animal, but alſo in thoſe of different ages, "ſizes, and kinds, whence happily ſome cu"rious obſervations may ariſe." And indeed he has furniſhed us with a great many very curious experiments, which may be of conſiderable uſe in carrying on to the deſired perfection an hydraulical view of the animal body.

In the mean time he concludes from his own obſervations, That the quantities of blood paſſing through the hearts of different animals in a given time, and the forces of the blood in the veſſels, are not proportioned in any regular way to their ſizes, p. 44.

To give a detail of all his experiments, would be to tranſcribe a great part of the book. We ſhall only give the ſubſtance of a few of the cardinal obſervations that are of the greateſt conſequence, and moſt out of the ordinary road.

The force which the left ventricle of the heart ſuffers, or wherewith it ſqueezes the blood in the beginning of its contraction, is 113 lib. in a mare, whoſe arterial blood roſe to 114 inches perpendicular height in a glaſs tube, fixed into the carotid artery, p. 21. In a dog, whoſe blood roſe 80 inches high, he determined the force of the ventricle to be 33 lib. and a half, p. 38. And he thinks that, in a man of a middle conſtitution, the blood would riſe 90 inches, and the compreſſive force of the heart to be 51 lib. and a half, p. 40.

P. 48. &c. He gives an experimental proof of the great reſiſtance the blood meets with in paſſing through the ſmall arteries. “ And to “ this reſiſtance is owing the great difference “ of the force of the blood in the arteries “ to that in the veins, viz. as 10 or 12 to 1.” p. 55.

Becauſe equal quantities of blood paſs through the lungs, and all the reſt of the body in the ſame time, it is commonly reckoned that the blood has a much greater celerity in that viſcus, than in its ordinary courſe through the body. To confirm and illuſtrate this, Mr Hales obſerves, that the parts of the body through which there is a free circulation, are about thirty times heavier than the lungs, p. 64.; and that a quantity of blood equal to twenty eight times the capacity of the pulmonary veſſels paſſes through them in a minute, p. 66. To ſtrengthen which calcules, he finds by microſcopical obſervations (if the computation were juſt) the celerity of blood in the ſmall arteries of the lungs of a frog, is forty three times greater than in equal arteries of the muſcles, p. 68. 69.

Mr Hales having obſerved the lungs to be much dilated, by pouring in blood into the pulmonary artery of lungs taken out of the body, p. 75. and ſeeing the lungs diſtended in a living dog, after a large inciſion had been made into the cavity of the thorax, concludes the natural dilatation of the lungs in living animals, to be owing partly to the blood forcibly propelled into them by the pulmonary arteries, p. 77.

P. 323. From the diminution of the elaſticity of the air, by the breath of animals, he takes occaſion to ſhew the miſchievous conſequences of crowding many people together, as in jails, &c. and obſerves of what great benefit it would be to contrive thoſe places in ſuch a manner as that they might have a conſtant eventilation, or new recruits of freſh air. A precaution which Romazzini very judiciouſly recommended to be uſed in the dormitories of convents.

Mr. Hales, in his firſt volume had reckoned the quantity of moiſture expired by the lungs in a natural day to be about ſix ounces and a half, almoſt the ſame Sanctorius reckoned from the drops collected upon a glaſs. But Dr Liſter thought that two ſmall an allowance by much. Now Mr Hales, by making his breath paſs through dry aſhes, found the expired moiſture to be at the rate of 9792 grains, or $\frac{9792}{438}=22\frac{1}{3}$ ounces, or 1, 39 lib. averdup. which falls in pretty nearly with Dr Thruſton's conjecture, when he ſuppoſed the quantity expired by the lungs to be equal to the perſpiration from all the reſt of the body.

Becauſe, in the common method of injecting the animal veſſels with a ſyringe, one cannot be aſſured with what force the injected liquors are impelled; our author thought of a way of doing it, as it were, hydroſtatically, by the weight of the ſuperincumbent column of the injected liquor, which ſhould be conſtantly uniform, and nearly equal to the force of the arterial blood, p. 145. And on this occaſion, p. 148. he makes public Mr Ranby's injecting matter, which conſiſts of white roſin and tallow, of each two parts, eight parts of turpentine varniſh, and three parts of the tinging powder, as vermilion or indico, all duly mixed and prepared.

From his injections and microſcopical obſervations, he alledges, that the very minute extreme arteries ariſe all at right angles from their reſpective trunks, and do not form any net-work or inoſculations with each other (as he allows the larger capillaries to do) and that they are moſtly inſerted at right angles into large venous trunks. See p. 51. 67. 70. 150. 151.

From a careful obſervation of the appearance of common fleſh, Dr Lower reckoned the contraction of a muſcle to be owing to the criſpation of its fibres. This ſeems to receive ſome confirmation from a very curious microſcopical obſervation of Mr Hales, upon the action of the muſcles in a live frog, whoſe parallel fibres he obſerved in contraction to be changed into rhomboidal pinnulæ, p. 61.

This author did not confine himſelf to the conſideration of the forces of the fluids; he likewiſe gives us ſome new and curious experiments of the ſtrengths of the arteries, veins, perioſteum, and ligaments, p. 155.———172

He eſtimates the preſſure of the ſtomach on the aliments to be about 20 lib. inſtead of the immenſe and incredible forces ſome had aſcribed to it, p. 179.

Upon transfuſing warm water inro a dog, when the blood came to be very diluted, he died, p. 114. and had an univerſal dropſy from the oozing of the watery parts of the too thin diluted blood through the ſmall orifices that are not large enough to admit the red particles, p. 116. Lower had formerly found the ſame effect from making ligatures upon the veins.

As Dr Keil had obſerved how ſome people are ſubject to head-achs and fluſhings of the face after dinner, from the diſtenſion of the ſtomach; in the like manner Mr Hales remarks, that the ſtatulent are often ſubject to a ſhort ſwimming or vertigo, from the wind diſtending the gullet, and ſo preſſing on the deſcending aorta, whereby the blood is too forcibly driven to the ſuperior parts, p. 183.

Although the operation of ſeveral medicines may be pretty well underſtood, yet ſince it is making ſome advance in knowledge further to illuſtrate even known truths, our author, by injecting various liquors, ſhewed their great powers of relaxing or ſtraitening the veſſels. Heat and warm water were found to relax them. The aſtringents he tried were cold water, ſpirit of wine, decoctions of Peruvian bark, of oak bark, of chamaemel flowers, of cinnamon and Piermont water, p. 127.——135.

Mr Hales, in his firſt volume, had obſerved, that an urinous calculus was the body in the world wherein he found the greateſt quantity of air wrought into its compoſition, and thence conceived great hopes of finding out ſome menſtruum which might rouze this active principle, and ſo diſſolve that moſt formidable concretion, which has hitherto baffled all human art and contrivance. Many, but fruitleſs, were his trials; however, at length he found a menſtruum, and that not very acrid neither, which, though it could not well be reduced to practice, has a great power this way, eſpecially on the ſofter calculi, from which we are encouraged to hope for greater light and advantage in this matter. It is a ſolution in water in the ſtrongeſt alcali, and the ſtrongeſt acid, juſt in the act of efferveſence, to wit, ſalt of tartar and oil of vitriol, or of ſulphur, p. 203. &c.

That the effect of any menſtruum injected into the bladder for diſſolving the calculus may not be prevented by the mixture of too much urine, he propoſes to make a continual flow of liquors into, and out of the bladder, during the injection, by uſing a catheter, the cavity of which is divided length-ways, by a thin partition, into two ſeparate channels, which end in two divaricating branches. By one of theſe branches, he injects the menſtruum into the bladder, in the common, or rather in the hydroſtatical way, while it returns mixed with urine by the other branch, p. 212.

Onions have a greater diſſolving power of the gravel than ſome other hot alcaleſcent plants, as ſcurvy-graſs or horſe-radiſh, p. 215.

The gravel more readily attacks thoſe of a hot conſtitution, and men, than people of a lax conſtitution and women, becauſe, in the former, the urine is more highly alcaliſed, attenuated, and digeſted, p. 217. 218. The more attenuated and digeſted aliments are moſt liable to breed calculous concretions, contrary to the doctrine of the antients, p. 221. 222. Probably ſtones increaſe moſt in the hot ſeaſons, otherwiſe than what *Aretæus (de Chron. &c.* 11. 3.) reckoned, p. 225.

For better preventing the gravel, Mr Hales propoſes lying as ſoldiers do in their barracks, not in a horizontal, but a reclined poſture, with the head and upper parts of the body conſiderably higher than the feet and lower parts; whereby the urine is not detained ſo long in the kidneys, as to allow its tartarous parts to attract each other, p. 229.

Our author gives us a new and very ingenious contrivance of a forceps, for extracting a ſtone ſticking in the urethra, which Mr Ranby and other ſurgeons have uſed with very good ſucceſs. He made it thus: “ He cut off the “ lower end of a ſtrait catheter, which made it “ a proper canula for a ſtilet or forceps to paſs “ through; the lower end of the forceps was “ divided into two ſprings like tweezers, “ whoſe ends were turned a little inward: “ Theſe ſprings were made of ſuch a degree of “ tenderneſs and pliancy, as not to bear too “ hard againſt the ſides of the urethra by their “ dilatation.

“ When this inſtrument is uſed, the ſprings “ are drawn up within the canula; which

" being paſſed into the urethra as far as to the " ſtone, the canula muſt then be drawn back " ſo far as to give room for the forceps to dilate; which dilated forceps being then thruſt " down a little further, ſo as to embrace the " ſtone, then the canula muſt be again ſlid " down, to make the forceps take faſt hold of " the ſtone, ſo as to draw it out."

Dr J. Ad. Kulm, profeſſor of anatomy at Dantzick, obſerving the difficulties which attend the diſtenſion of the bladder with a liquor in performing the high operation for the ſtone, eſpecially in women, has contrived an elevatory catheter of the bladder for that ſex.

The bending of it is fitted to the turn of the *os pubis*, and its great curve, inſtead of being only furrowed on the convex ſide, is pierced quite through. He introduces this catheter into the bladder, with its convexity to one ſide; then gently raiſes it to the hypogaſtrium, and cuts ſecurely upon it. *Nova Act. Erudit. Lipſ. Mart.* 1732.

Saltzmannus relates an inſtance of a luxation of the thigh-bone, without any fracture of its neck, and confirms what Ruyſch had obſerved of the epiphyſe of the *os femoris* being as it were annihilated, or at leaſt being changed ſo as it could not be obſerved when ſought after in one who had it broken. *Comment. Acad. Petropolit. Tom.* III, p. 275.

Oliver St John, Eſquire, gives the deſign in perſpective of the arcuccio, an inſtrument to prevent the overlaying of children, which the nurſes in Florence are obliged to lay children in under pain of excommunication. It conſiſts of a ſemicircular piece of wood, or head-board, of one foot and an inch diameter, to each ſide of which a board three foot two inches and a half-long is faſtened. Each of theſe has a hollow on the upper-edge, near to the head-board, for the nurſe's breaſt to reſt in when ſhe gives ſuck, and a ſemicircular arch of iron is fixed to them near the other end. From the top of the head-board to the middle of the iron-arch, there is a bar of wood fixed, on which the nurſe leans when ſhe ſuckles the child. The arcuccio with the child in it may be ſafely laid entirely under the bed-cloaths in the winter, without danger of ſmothering. *Philoſ. Tranſact. Numb.* 422. § 6.

Dr Wintringham's *Commentarium noſologicum*, being principally a conciſe narration of facts, will not allow of an abridgment; but we cannot but refer our readers to the book itſelf, where they may ſee an induſtrious accurate compariſon of the changes of the air with epidemic diſeaſes, accompanied with a very ingenious aetiology modeſtly propoſed. Among the many judicious reflexions this author makes on the cure of diſeaſes, according to their different circumſtances, we ſhall only mention two that relate to the preſent raging epidemic diſeaſe of this place, the ſmall-pox.

P. 63. He never obſerved antiphlogiſtic medicines that open the belly, diluent clyſters, or ſuch like, to have any bad effect in this diſeaſe, by weakening the patient, or making the ſwellings of the face and extremities fall; but,

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on the contrary, has always ſeen them very ſerviceable to young vigorous plethoric patients, while too bound a belly frequently produces at laſt a very dangerous diarrhœa.

Queſt. 23. He propoſes, in urgent caſes of the confluent ſmall-pox, where the reſorption of the variolous matter is in great danger of increaſing the ſecundary fever, that the puſtules ſhould all be opened and treated as ſo many ulcers by a ſurgeon.

Dr Hilcher, profeſſor of medicine at Jena, in a ſmall eſſay, intitled, *Proluſio de amputatione et raſura capillorum in variolis*, recommends the cutting off the hair in the ſmall-pox, by which perſpiration may be increaſed. This method was practiſed on the King of Spain's ſon Don Carlos, and on a Saxon prince, with ſucceſs.

The urine of phthiſical people is ſaid to be always ſpecifically heavier than that of the people in health, or in any other diſeaſe. *Commerc. Norimberg.* 1732, *Hebd.* 44.

The ſame anonymous author, who deſcribed the cholic that prevailed in Amſterdam in 1730, has continued his diſſertation on theſe colics, to ſhew the other cauſes, beſides the gout, on which they may depend; and conſequently how differently they ought to be treated. *Bibliotheque raiſonnée des Ouvrages des Scavans de l'Europe, tom.* IX. 1. 2. *Parties.* In his laſt paper he mentions ſome curious enough obſervations he made on ſucking rabbits, that were taken with vomiting, purging, and convulſions, in the ſtomach of which he found the milk ſtrongly curdled, and moſt abominably foetid.

Dr William Cockburn, phyſician at London, diſtinguiſhes fluxes into thoſe from a ſtimulus, and thoſe from a greater than ordinary ſecretion of a watery ſubſtance from the blood into the guts. The former is to be treated according to the different ſtimuli. When it proceeds from indigeſted food, fruits or ſuch like, the common methods will be ſucceſsful enough, or it will cure of itſelf. When bile is the cauſe, it is more difficult. If the piles, an ulcer, or ſtricture of the guts, act as ſtimuli, the way of treating the flux muſt be very different. And, in the watery flux, all the common methods of purging, vomiting, and aſtringents, are hurtful. *Philoſ. Tranſact. Numb.* 425. § 3.

Dr Dovar, in his book called, 'The antient phyſician's legacy to his country,' propoſes cures for diſeaſes that frequently are different from the ordinary practice. We ſhall ſet down ſuch of them as ſeem to be moſt uncommon.

According to him, a gouty patient will be free of pain, two or three hours at fartheſt after taking a doſe, which is from forty to ſeventy grains, of the following powder. Take ſaltpetre, and tartar vitriolated, each four ounces; put them in a red hot mortar; ſtir them with a ſpoon till they have done flaming; then powder them very fine; and after that ſlice in an ounce of opium: Grind theſe to a powder; and afterwards mix with it an ounce of the powder of ipecacuana, and as much of the powder of liquoriſh. This powder is to be taken, going to bed, in a glaſs of white wine poſſet-drink, covering up warm, and drinking a quart or three pints of poſſet-drink while ſweating.

Mynſicht's elixir of vitriol often taken, though it may cauſe pain for ſome time, yet moſt certainly deſtroys the gouty matter, and muſt in the end have its deſired effect.

One who writes notes to the Legacy, ſuſpects the Doctor's cure for a dropſy, which he had not told, to be *ol. juniper.* or elſe an infuſion of juniper berries roaſted, and made into a liquor like coffee.

His cure for an anaſarca is an electuary compoſed of ſteel, prepared with ſulphur and crude antimony, each an ounce, diagridium four ounces; make a fine powder of theſe, then add as much of any ſyrup as will make a ſoft electuary. The doſe, a large ſpoonful at night, going to bed, and another in the morning. Liquors muſt not be taken with this purge.

Allom poſſet-drink is an effectual cure for a diabetes.

A *Phthiſis pulmonalis*, or conſumption of the lungs, is principally to be cured by frequent bleeding in ſmall quantities. In one patient, he determines the quantity to have been ſix ounces once a day for a fortnight.

The moſt beneficial thing in all the world for the lungs, is, in our author's opinion, to take an ounce of quick-ſilver every morning. This is his darling medicine, which he alſo recommends in the ſtone or nephritis, barrenneſs,

renneſs, chloroſis, diſeaſes of the ſtomach and inteſtines, &c.

Green fruit deſtroys worms, ripe fruit breeds them.

He recommends large doſes of *mercurius dulcis* with *cinnabar* of antimony in the nervous or head diſeaſes, palſy, hemiplegia, epilepſy, apoplexy.

He cured the plague that had got among the ſailors in a voyage to the South-ſea, by one very plentiful bleeding, he ſays, to the quantity of an hundred ounces, and with drink ſharpened with ſpirit and oil of vitriol.

In ſpotted fevers, he recommends large bleedings, purging every other day, with a paregoric at night, and cooling acidulated medicines in the intervening days.

He cured a young man of ſuch a fever, and a violent hæmorrhage at the noſe, by putting him into cold water.

In the confluent and anomalous ſmall-pox, he recommends *mercur. dulc.* and *cinnab. antimon.* on the ſeventh and thirteenth days.

In an angina or quinſy, beſides high bleeding, he recommends a gargariſm, compoſed of ſublimate mercury half a drachm, cream of tartar two drachms, diſſolved in a pint of ſpring water.

Bleeding, he affirms, is no remedy in the rheumatiſm; though this diſeaſe is, in his opinion, an high inflammatory fever.

Fevers on the ſpirits are cured by the bark, in the ſame manner as the ague is.

In diſeaſes of the ſtomach, our author is againſt vomiting; but thinks purging more reaſonable.

XXXV. *A Liſt of Medical Books publiſhed ſince the beginning of the Year* 1732.

H*Iſtoria vitæ et meritorum Frederici Ruyſch, Auctore* Joanne Frederico Schreibero, M. D. 4to. Amſtelod. 1732.

Variolarum Antiquitates nunc primum e Græcis erutæ, a Jo. Gothofredo Hahn *Phil. et Med. D. Accedit de* Meſuæ Syri *ſcriptis ad* Cel. Fabricium *Epiſtola, 4to,* Brigæ 1733.

Bartholomæi Lavagnoli, in Patav. gymnaſio Med. Theor. Pr. *de uſu pravo et recto diſciplinarum optimarum in medicina opus, in tres partes diviſum, pars* 1*ma, de uſu Chemiæ,* Pataviæ 1732.

The State of Phyſic, antient and modern, briefly conſidered, with a plan for the improvement of it, by *Francis Clifton,* M. D. *&c.* 8*vo, London* 1732.

A brief and diſtinct account of the mineral waters of Piermont, tranſlated from Scippius's treatiſe; as alſo a like account of the waters of Spaw, extracted from the beſt authors, by *George Turner,* M. D. 8*vo, London* 1733.

A Treatiſe of mineral waters, particularly of Bath, in Somerſetſhire, &c. by J. Quinton, M. D. 8*vo, London* 1733.

The natural, experimental, and medicinal hiſtory of the mineral waters of Yorkſhire, Derbyſhire, and Lincolnſhire, by Thomas Short M D. 4*to, London* 1733.

Adolph. Gottlieb. Richteri Ph. et M. D. *de* *corruptelis medicamentorum cognoſcendis tractatus medico-chemicus*, 8*vo*, Dreſdæ & Lipſiæ 1732.

An account of mortifications, and of the ſurpriſing effects of the bark, in putting a ſtop to their progreſs, *&c.* by John Douglaſs ſurgeon, F. R. S. 8*vo*, *London* 1732.

Jo. Helfrici Junkhen *Corpus Pharmaceutico-chymico medicum. Editio tertia, prioribus longe auctior reddita, per* Davidem de Spina, M. D. *fol.* Francofurt. ad Mænum 1732.

Dr Boerhaave's elements of chemiſtry, faithfully abridged from the late genuine edition publiſhed and ſigned by himſelf at Leyden. With all the cuts and explanations, as in the original. To which are added curious and uſeful notes, rectifying ſeveral opinions, *&c.* of the learned author. By a phyſician, 8*vo*, *London* 1732.

Some obſervations on the tranſlation and abridgment of Dr Boerhaave's chemiſtry, wherein the learned profeſſor is vindicated from the unjuſt repreſentations and weak criticiſms of his abridger, in a letter to Cromwell Mortimer, M. D. R. S. Secr. by John Rogers, M. D. 8*vo*, *London* 1733.

Tabulæ anatomicæ, in quibus corporis humani omniumque ejus partium ſtructura et uſus breviſſime explicantur. Acceſſerunt majoris, perſpicuitatis cauſa, annotationes et tabulæ æneæ. Auctore Jo. Adamo Kulmo Prof. Gedanenſi, 8*vo*, Amſtelod. 1732.

Joſephi Pozzi Prof. Bononienſis *Orationes duæ; quibus accedit epiſtolare anatomicum commentariolum*, 4*to*, Bononiæ 1732.

Lettre de Mr Petit, docteur en medicine, &c. *contenant des reflections ſur des decouvertes faites ſur les yeux*, 4*to*, a Paris 1732.

An eſſay on muſcular motion, founded on experiment, obſervation, and the Newtonian philoſophy, by Browne Langriſh ſurgeon, 8*vo*, London, 1733.

Statical experiments, containing hæmaſtatics, or an account of ſome hydraulic and hydroſtatical experiments made on the blood and blood-veſſels of animals, *&c.* by Stephen Hales rector of Farringdon, 8*vo*, *London* 1733.

Opere ſiſico mediche ſtampate e manoſcritte del Cavalier Antonio Valiſneri, *raccolte da* Antonio *ſuo Figliuolo, corredate d'una præfatione in genere ſopra tutte, di una in particulare ſopra il vocabularic della ſtoria naturale*, Tom. 1. *fol.* Venet. 1732.

An eſſay on the improvement of midwifery, chiefly with regard to the operation, to which is added fifty caſes, ſelected from upwards of twenty-five years practice, by Edmond Chapman ſurgeon, 8*vo*, *London* 1733.

Henrici a Deventer, M. D. *Ars obſtetricandi. Editio* 2*da*, *cui novæ obſervationes acceſſerunt.* 4*to*, Lugd. Bat. 1733.

Colloquia chirurgica; the fourth edition, by James Handley, 8*vo*, *London* 1733.

Traité complet de chirurgie, par Guillaume Mauqueſt de la Motte *chirurgien*; *ſecond edition revuë, corrigee, & augmentée*, en 4 Tomes 12*mo*, a Paris 1732.

Rari caſus explicatio anatomico-medica, autore Thoma Schwenke, Pr. M. D. Anat. 8*vo*, Hagæ 1 33

Morbi epidemici brevis deſcriptio et curatio per diaphoreſim, Autore Joanne de Gorter, M. D. *et* P. 4*to*, Harderwic. 1733.

Commentarium noſologicum morbos epidemicos et aeris variationes, in urbe Eboracenſi lociſque vicinis per ſedecim annos graſſantes, complectens. Autore Cliftono Wintringham, M. D. 8*vo*, Londini 1733.

An eſſay concerning the effects of air on human bodies, by John Arbuthnot, M. D. 8*vo*, *London* 1733.

Joannis Freind, M. D. *opera omnia medica, fol.* Lond. 1733.

La medicine theologique, ou la medicine crée telle qu'elle ſe fait voir ici ſortie des mains de Dieu, createur de la nature et regie par ſes loix. On y a joint a fin le theſes de medicine de l'auteur de ce traité, Mr Hacquet, 2 *vol.* 12*mo*, a Paris, 1733.

A diſcourſe on the nature and cauſe of ſudden deaths, 8*vo*, *London* 1733.

Obſervationes medicæ, a G. Clinch, M. D. 8*vo*, London 1733

M. Ludovici Joannis de Thieulier, *in* univerſitate Pariſienſi Regentis, *Obſervationes Medico-practicæ*, 12*mo*, Paris 1732.

The antient phyſician's legacy to his country, being what he has collected himſelf in forty nine years practice, by Thomas Dovar, M. D. 8*vo*, *London* 1732.

Several pamphlets for and againſt the preceeding book.

The Engliſh malady, or a treatiſe of nervous diſorders of all kinds, by George Cheyne, M. D. 8*vo*, *London* 1733.

LeBrigandage de la medicine dans la maniere de traiter les petites veroles, et les plus grandes maladies par l' emetique, la ſaignée du pied, & le kermes mineral. Avec un traité de la meilleure maniere de guerir les petites veroles par des remedes & des obſervations tirées de l'uſage, 12*mo*, a Utrecht 1732.

Obſervations de medicine ſur la maladie appellée convulſion, par un Medicin de la Facultée de Paris, 12*mo*, a Paris 1732.

A letter to Sir Hans Sloane about the cure of the gout, by Dr Stuckley, 8*vo*, *London* 1733.

Geo. Dan. Goſhwitzius, M. D. *de gravidarum et puerperarum, nec non de infantum recens natorum regimine et affectibus*, 4*to*, Lipſæ & Suidnicii 1732.

Jo. Phil. Burggravii jun. *Lexicon medicum univerſale, Tom* 1. *continens A. B. fol.* Francofurti ad Mænum 1733.

Philoſophical Tranſactions for the year 1732, 4*to*, *London.*

L'Hiſtoire & les Memoires de l' Acad. des ſciences, Année 1730, 4*to*, a Paris 1733, & 12*mo*, a Amſterd.

Commercium literarium Norimbergenſe, *Anni* 1732 ſemeſtr. 2.——————Anni 1733 ſemeſt. 1. 4*to*, Norimberg.

Commentarii Academiæ Scientiarum Imperialis Petropolitanæ, Tom. III. *ad Annum* 1728, 4*to*, Petropoli 1732.

XXXVI.

XXXVI. *BOOKS propoſed, and other Medical News.*

JOSIAS Weitbreicht profeſſor of phyſiology at Peterſburgh is preparing a *Deſmologia*, or a deſcription and delineations of all the ligaments of the human body.

Dr Trew, profeſſor of anatomy at Norimberg, is engaged in an examination of the ligaments of the bones.

Dr Vercelloni, phyſician at Aſti, is ſoon to publiſh a treatiſe under the following title: *Pſycologia, ſeu motuum animalium et reciprocorum machinæ animalis theoria medica, omnes humanos actus autoptica et facili quamvis hactenus inaudita methodo explanans.*

The chirurgical academy at Paris, mentioned in our firſt volume, p. 361. will ſoon publiſh a volume of memoirs.

Dr John Arbuthnot, in the preface to his eſſay concerning the effects of air on human bodies, promiſes to complete his account of the non-naturals, by a treatiſe on reſt and motion.

Dr Albrecht, profeſſor of medicine at Erford, is preparing a treatiſe, *De effectibus muſices in corpus animatum in extenſo.*

Dr Keſtner is compoſing a *Lexicon literarium medicum.*

The chirurgical academy at Paris has propoſed the following problem this year: What is the advantage or diſadvantage of different kinds of tents uſed in enlarging wounds according to the different circumſtances of the diſeaſe and patient?

The ſociety of St Hubert at Liſbon in Portugal, were to give their laſt year's prize to him who accounted beſt for the cauſe and nature of the plague.

Dr Gohl, who publiſhed the *Acta Medicorum Berolinenſium*, died in the 1732; but it is expected that Dr Chudenius will continue that work.

Daniel Fiſcher, phyſician at Keſmark, has undertaken to collect and publiſh the obſervations of the Hungarian phyſicians mentioned in our former volume, and has diſperſed an invitation to engage them to communicate papers to him.

The End of the Second Volume

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